

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard					SIS	
B01 = Trouble-shooting chart	A	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	B	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	C	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	D	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
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N01 = Service information	N	*XXXX	XXXXX	XXXXX	XXX	*X XX*
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						Index



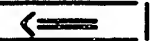

N28 = Table of contents and publication information

- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section
A01			=> <=

HOW TO USE THE MICROCARD

Trouble-shooting instructions for
System: Mono-Jetronic
Descriptions, photographs, terminal designations and special features refer to vehicle:
VW Golf 1,8 Inject.
1,8 1/4 Zyl.-Motor A/CH/D/S 11.87 ->

These basic instructions are comprehensive trouble-shooting instructions. They must not be used as vehicle-specific instructions. Caution! Descriptions and photographs may deviate from the vehicle-specific brief instructions.
Mandatory set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only. For brief instructions, see table of contents Microcard KFZ-00..

A02		=> <=
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SPECIAL FEATURES

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

- * The assignment screw (at the bottom of the throttle-plate lever) is not used to set the idle speed. It is used to adjust the assignment of the throttle-valve position to the throttle-valve actuator. This is only necessary when renewing the throttle-valve section or the throttle-valve actuator.
- * Do not turn stop screw (minimum stop) of throttle valve, as otherwise a fault is detected by the control unit. The screw is permanently set and secured against turning.
- * Do not actuate idle contact with throttle valve deflected (part and full-load range). This could cause the throttle-valve actuator to block.
- * Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as otherwise there may be a change in fuel pressure.
- * Do not adjust throttle-valve potentiometer. There is no after-sales-service possibility of checking the assignment of the throttle-valve position (angle) to the potentiometer.

SPECIAL FEATURES (CONTINUED)

- * Low-pressure injection system (approx. 1 bar).
- * Fuel supply by means of internal-gear in-tank pump.
- * Throttle-body injection unit consisting of: hydraulic section and throttle-valve section.
- * Pressure regulator integrated into hydraulic section.
- * Induction of fuel by means of solenoid-operated injection valve above throttle valve.
- * Load detection by means of twin potentiometer, via opening angle of throttle valve.
- * Safety circuit by way of pump relay actuated by control unit.
- * Lambda sensor
- * Throttle-valve actuator with idle contact for engine-speed regulation.
- * 25-pole control unit with self-diagnosis.
- * Plausibility, i.e. in the event of defective sensors, a substitute value is provided by the control unit.
This applies to the following sensors, temperature sensor (engine), temperature sensor (intake air) and idle switch.
- * Injection triggering at control unit term. 1 by means of ignition pulses from term. 1 or by means of TD rectangular signals from ignition trigger box.
- * Tank ventilation system with active-carbon container. Ventilation controlled as a function of load by control unit via frequency valve.
- * Refer to Service Information "New Mono-Jetronic System", Microcard KFZ-00 for supplementary system information.

SPECIAL FEATURES (CONTINUED)

Lambda closed-loop control with adaptive basic adjustment:

The Monojetronic is an adaptive system, i.e. changes in environmental conditions, which adaptively influence the induction of fuel under certain operating conditions, are recognized and automatic compensation is provided.

Changes in ambient conditions may be as follows:

- * Change in density of air (high altitude).
- * Change in quality of fuel (e.g. alcohol content).
- * Leakage air in intake system.
- * Changes in engine and fuel-induction system with increasing service life (drift).

Following repairs (e.g. elimination of considerable leakage air), it may be that the engine will exhibit unfavourable running characteristics for a short period after starting. This will however normalize again after a short period (if applicable following a short drive under load).

SPECIAL FEATURES (CONTINUED)

Tank ventilation system:

The fuel vapors occurring in the fuel tank are stored in an active-carbon filter. When the engine is running, it sucks off the fuel vapors. A pulsed tank ventilation valve, which is installed between the active-carbon filter and the intake manifold, meters the fuel vapors supplied.

The variable on/off ratio is output by the control unit as a function of the engine operating status and thus determines the opening cross-section of the tank ventilation valve. An excessive change in mixture is therefore avoided.

Self-diagnosis:

This is effected by way of flashing-code output. A diagnosis lamp (LED), which lights up after switching on the ignition and goes out after starting the engine, is located for this purpose in the instrument panel. A fault is indicated, however, if the lamp continues to light up during engine operation.

Diagnosis triggering: connect diagnosis lead (white/red, next to ignition coil) to ground for at least 4 s with auxiliary lead.

Malfunctions, which occur when driving, are stored in the fault memory of the control unit. Faults of relevance to emissions and safety (Carb faults) are indicated by way of the diagnosis lamp as long as they are present.

The fault memory must be cleared after eliminating all faults.

Storage is maintained even after switching off the ignition.

SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

For testing of compressions pressure, disconnect pump relay in order to prevent undesired injecting of the injection valves.

Do not short-circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and possibly control unit will be destroyed.

Never connect positive pole of battery to ignition coil term. 1. Control unit will be destroyed.

If installing an alarm system, follow installation instructions for L-Jetronic vehicles or SIS microcard KFZ-00.. Make sure that the alarm relay is not disturbed by external fields (e.g. from ignition leads), thus incorrectly triggering.

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Never start engine without battery securely connected (battery terminals tightened). Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.

Provide starting assistance only with second 12 V battery and jump leads.

Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

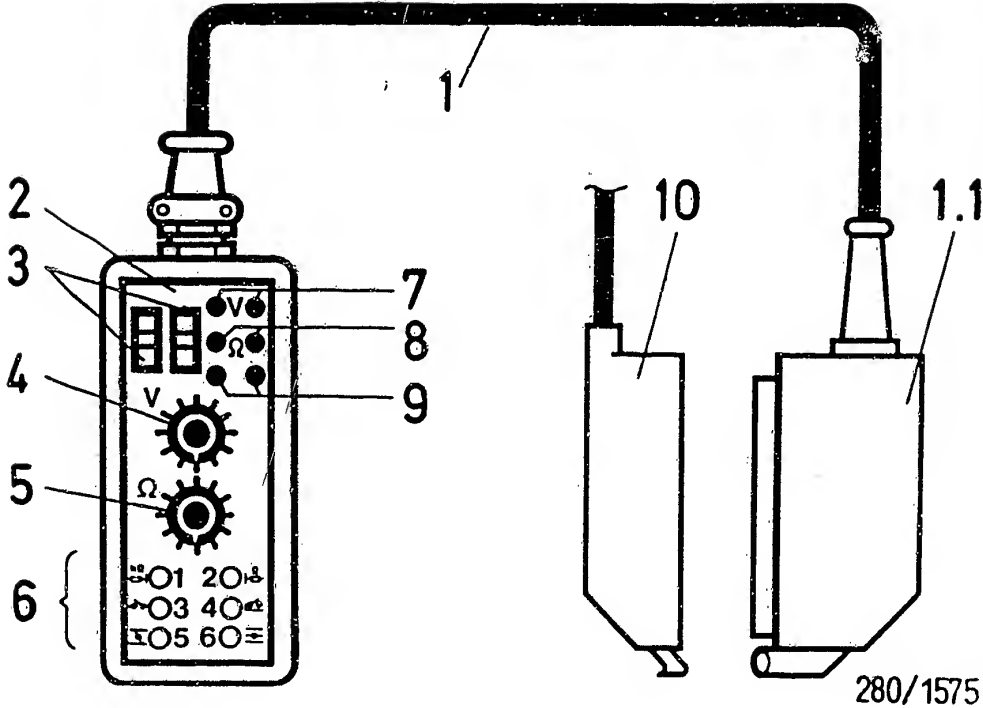
Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

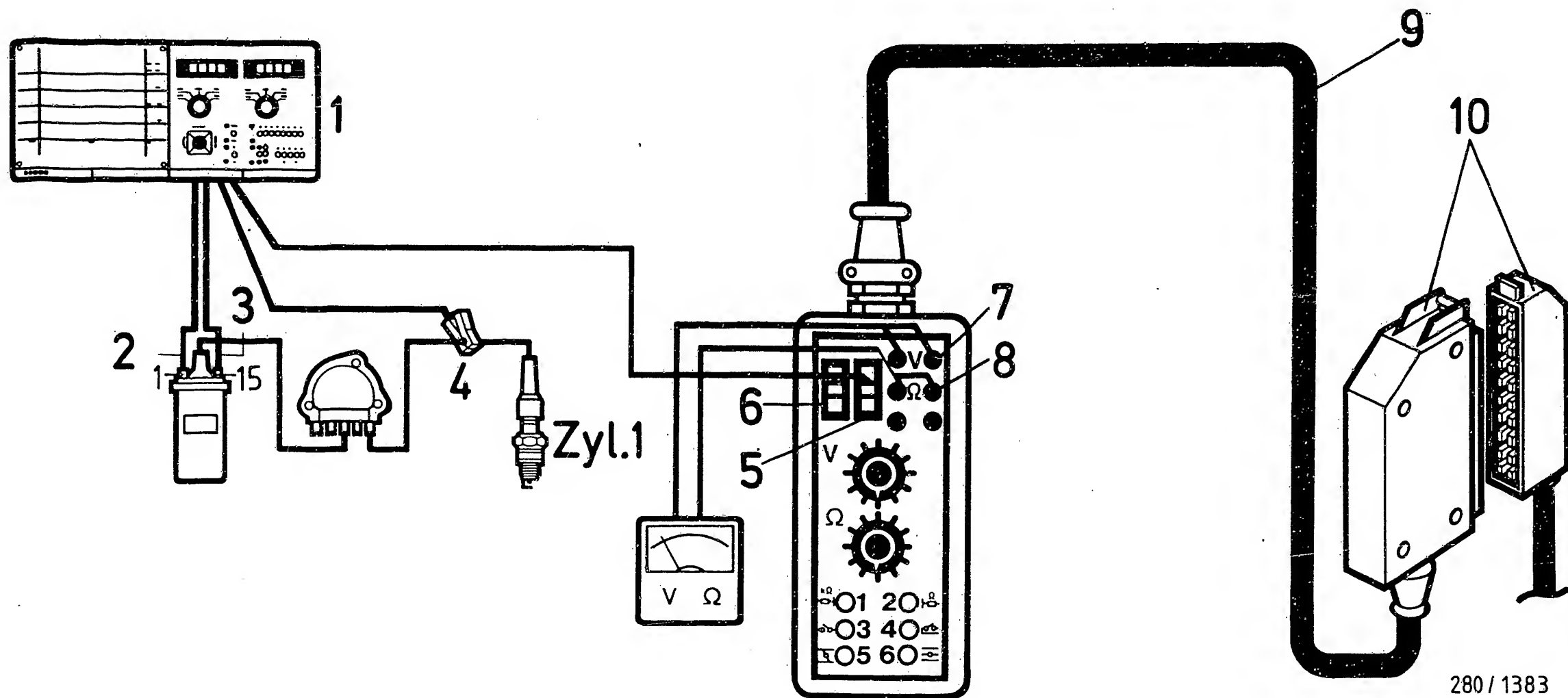
TESTERS AND TOOLS

Name	Designation	Part No.
Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 170
Engine tester e.g.	MOT 201	0 684 000 201
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Digital multimeter	MMD 301	0 684 500 301
Test leads	Fluke	75 or 77
		KDUM 0008
		KDZS 0004
CO analyser e.g.	ETT 008.14	0 684 100 814
	ETT 008.15	0 684 100 815
Lambda closed-loop control tester	ETT 018.10	0 684 101 810
Assembly paste for Lambda sensor	VS 14016 Ft 120 g	5 964 080 112
	450 g	5 964 080 145
Pressure measuring instrument	Quality class 1.0	KDJE-P 100/17
e.g. pressure gauge	Measuring range 1.6 bar	
	Scale division 0.02 bar	
Hose with union nut		KDJE-P 100/3
Three-way line		KDJE-P 100/13
Both contained in portable test set		KDJE-K 100
Interference-suppression sleeve 5 k Ω		0 356 500 001
Temperature sensor		0 280 130 028
Pressing-in tool for injection valve		KDJE-7463



Universal test adapter with adapter lead

- 1 = Adapter lead (1 684 463 170)
- 1.1 = Connection to wiring harness
- 2 = Universal test adapter (0 684 001 801)
- 3 = Test recesses (for engine tester)
- 4 = Program switch "V"
- 5 = Program switch " Ω "
- 6 = Button panel for simulation of operating conditions:
 - Button 1 = NTC II (engine), cold (+20°C)
 - Button 2 = NTC II (engine), warm (+80°C)
 - Button 3 = Pump actuation
 - Button 4 = Tank ventilation valve
 - Button 5 = Not used
 - Button 6 = Not used
- 7 = Test sockets (voltage measurement)
- 8 = Test sockets (resistance measurement)
- 9 = Only used for self-diagnosis
- 10 = Wiring harness

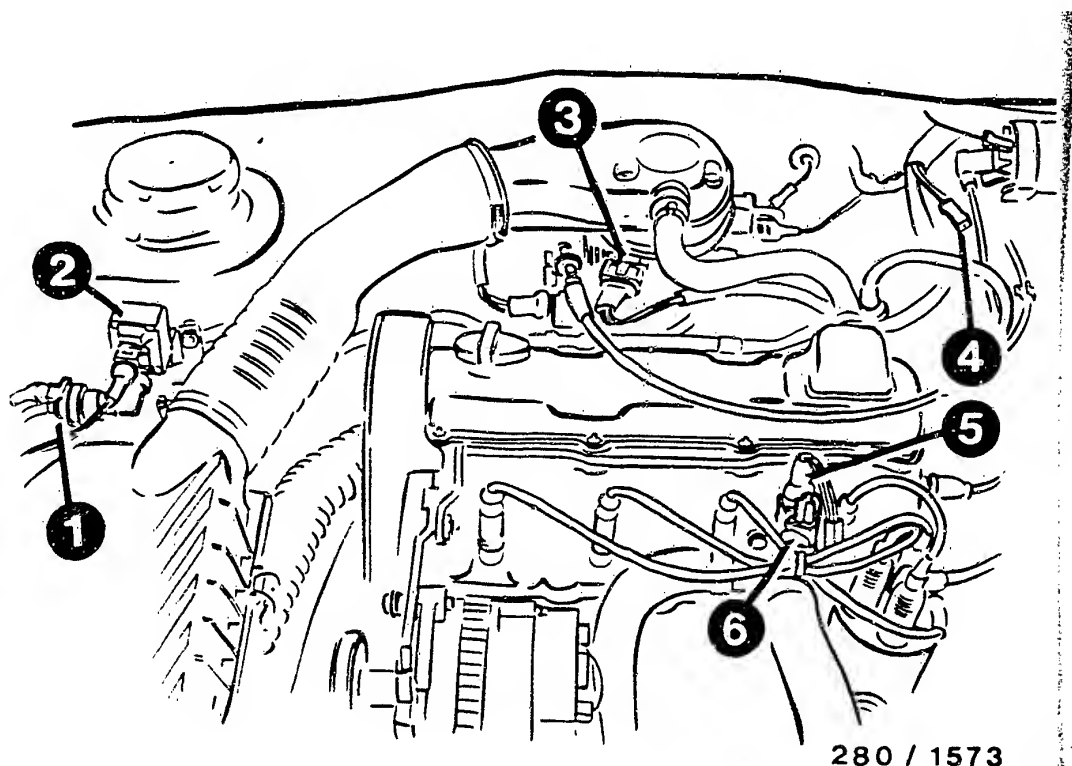


280 / 1383

Terminal diagram for universal test adapter

- 1 = Motortester
- 2 = Green clip at ignition coil term.1
- 3 = Yellow clip at ignition coil term.15
- 4 = Clamp-on induction pickup via ignition cable of 1st cylinder
- 5 = Black connector bushing (test well) for black terminal of motortester
- 6 = Red connector bushing (test well) for red terminal of motortester

- 7 = Terminal of voltmeter at V sockets (red = +, black = ground or -)
- 8 = Terminal of ohmmeter at Ω sockets (blue)
- 9 = Adapter lead (1 684 463 170)
- 10 = Connection to wiring harness

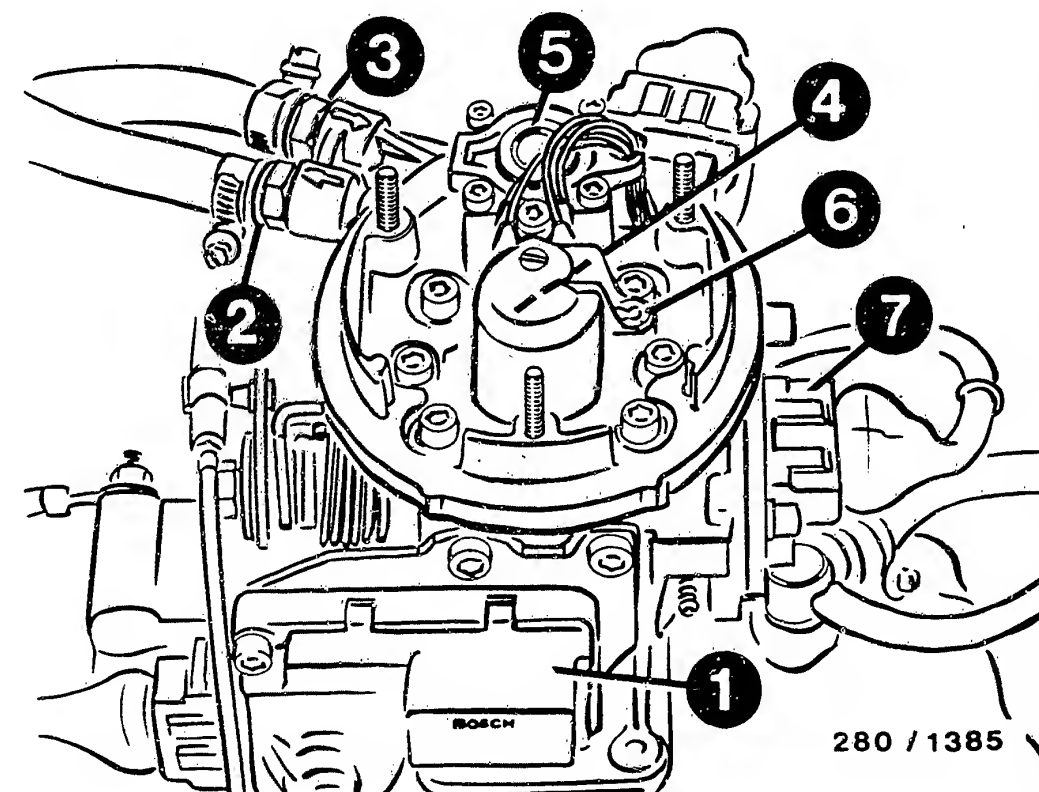


- 1 = Tank-ventilation frequency valve
- 2 = Tank-ventilation switching valve
- 3 = Throttle-body injection unit
- 4 = Diagnosis plug
- 5 = Temperature sensor (engine)
- 6 = Thermoswitch for intake manifold preheater

INSTALLATION POSITION OF COMPONENTS

All installation locations refer to the direction of travel.

Arrangement of components in engine compartment.



- 1 = Throttle-valve actuator
- 2 = Fuel return
- 3 = Fuel inlet
- 4 = Solenoid-operated injection valve
- 5 = Pressure regulator
- 6 = Temperature sensor (intake air)
- 7 = Throttle-valve potentiometer

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The electric fuel pump, which is normally designed as an in-tank pump, is combined with the fuel gauge and is accessible via a plug above the fuel tank.

The lambda sensor is screwed into the exhaust pipe ahead of the catalytic converter

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Top picture

1 = Tank-ventilation frequency valve

2 = Tank-ventilation switching valve

Both valves are secured to the right-hand spring-strut dome.

* Center picture

1 = Plug for injection valve and temperature sensor (intake air).

2 = Air scoop for air guidance

3 = Plug connection for throttle-valve potentiometer

4 = Ignition timing valve

5 = Exhaust sampling point

6 = Diagnosis plug

7 = Plug connection of lambda sensor lead

8 = Ground connection

* Bottom picture

1 = TIH ignition trigger box

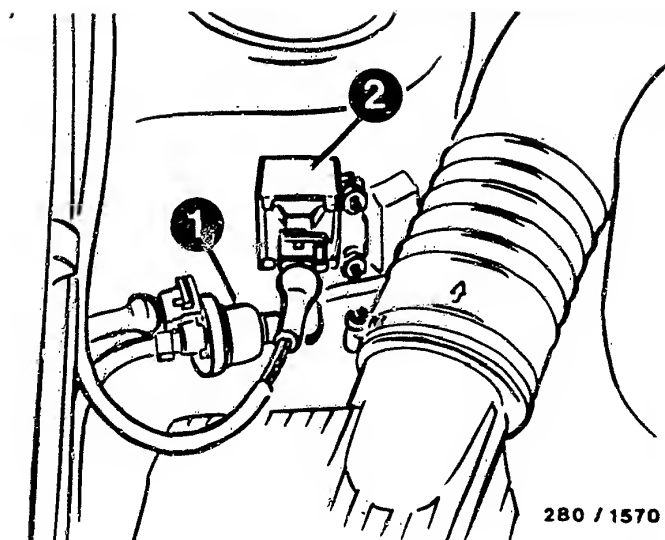
2 = Series resistor for injection valve

3 = Monojetronic control unit.

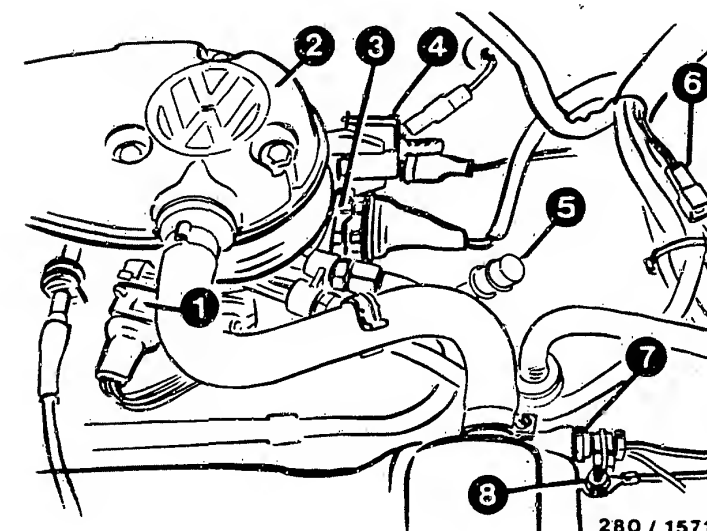
Further installation positions

* The pump relay of the safety circuit is located at relay position 12 on the relay plate beneath the instrument panel.

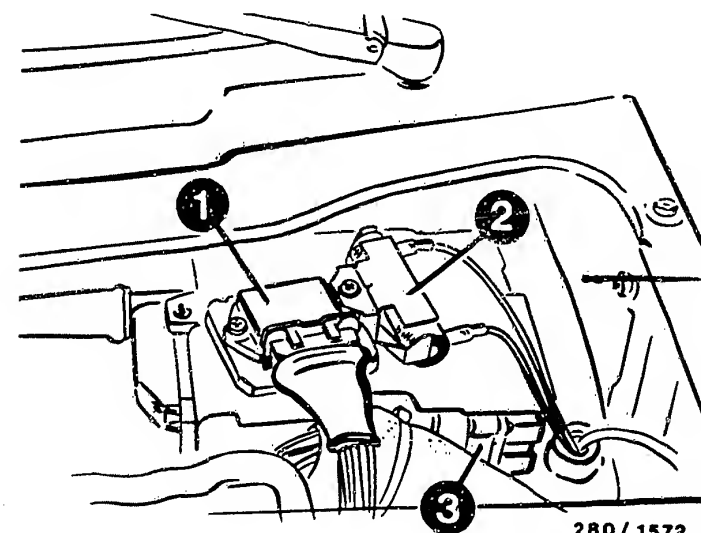
* The diagnosis lamp (LED) is located in the instrument panel.



280 / 1570



280 / 1571



280 / 1572

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removing and installing the temperature sensor (intake air).

Removal:

Release torx screw on the connector of the solenoid-operated injection valve and carefully pull off connector upwards. Using a screwdriver, unlatch 4-pin plug from the hydraulic section and remove.

Installation:

If necessary, use new parts set 3 437 010 ..

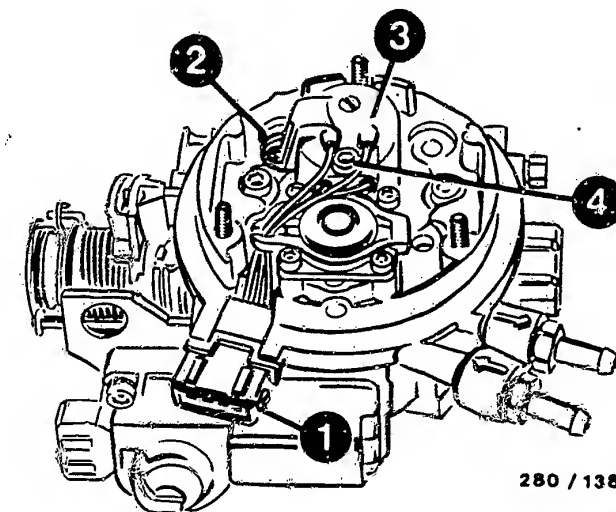
This contains the connector of the solenoid-operated injection valve with O-ring, temperature sensor (intake air), 4-pin plug and torx screw.

Insert 4-pin plug at hydraulic section and engage latching device correctly.

Position connector vertically and press down.

Caution, do not bend the pins of the injection valve.

Coat torx screw with small amount of screw-locking material (Loctite). Screw in torx screw, tightening torque 4...4,5 Nm.



280 / 1386

- 1 = 4-pin plug
- 2 = Temperature sensor (intake air)
- 3 = Connector
- 4 = Torx screw

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removal and installation of solenoid-operated injection valve.
It is necessary to remove and install the solenoid-operated injection valve for the following work:

- * Replacing solenoid-operated injection valve
- * Replacing hydraulic section (pressure regulator faulty).

Removal:

Reduce fuel pressure by releasing the inlet hose.
Collect any fuel flowing out.

Release torx screw on connector of the solenoid-operated injection valve and carefully pull off connector upwards.
Carefully lever out the solenoid-operated injection valve upwards with two pin punches (3 mm diameter) (see upper illustration).
Do not lever on one side only.
Take out solenoid-operated injection valve and lay down carefully.

Installation:

If the old valve is used again, use parts set no. 3 437 010 ...
This includes two O-rings for the solenoid-operated injection valve.

If installing a new valve, use a new parts set (for part number see service-parts microcard).
This includes a solenoid-operated injection valve with two O-rings.

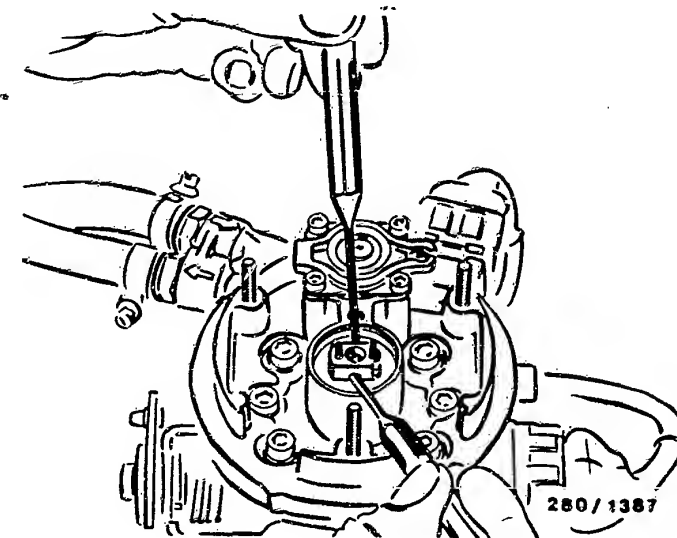
To ease installation, lightly wet O-rings with engine oil HD 30.
Pay attention to cleanliness.
Do not press in solenoid-operated injection valve with connector in position.

Insert solenoid-operated injection valve in the correct position in the valve seat and press in. Use tool KDJE-7463 (see lower illustration).

Mount connector vertically and press down.
Caution, do not bend pins of injection valve.

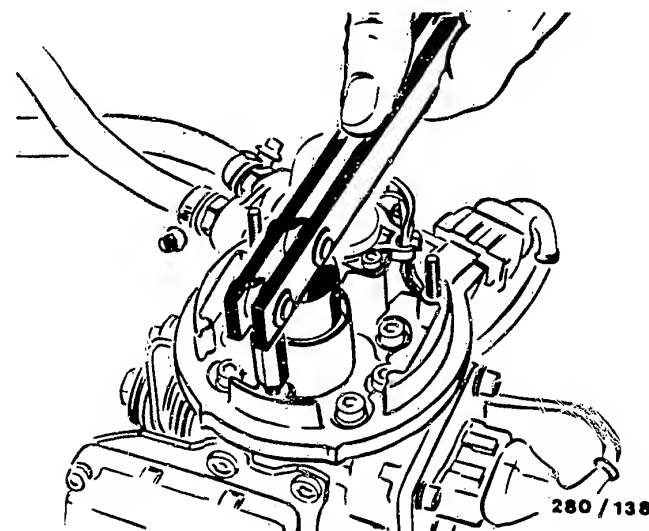
Coat torx screw with a small amount of screw-locking material (Loctite).
Screw in torx screw, tightening torque 4...4,5 Nm.

After installation, be sure to carry out leakage test of solenoid-operated injection valve. See Coordinate E 01



Removal of solenoid-operated injection valve with pin punches (3 mm diameter)

Installation of solenoid-operated injection valve with press-in tool KDJE-7463



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removing and installing throttle-valve actuator.

Necessary for following work:

- * Idle contact defective (at front, at adjusting shaft)
- * Renewal of throttle-valve actuator

Removal:

Switch off ignition. Detach connector from actuator.

Loosen Torx screws and detach actuator.

Remove sealing cap/locking compound from assignment screw at throttle-plate lever.

Installation:

Attach actuator and tighten Torx screws, tightening torque 4...4.5 Nm.

Caution

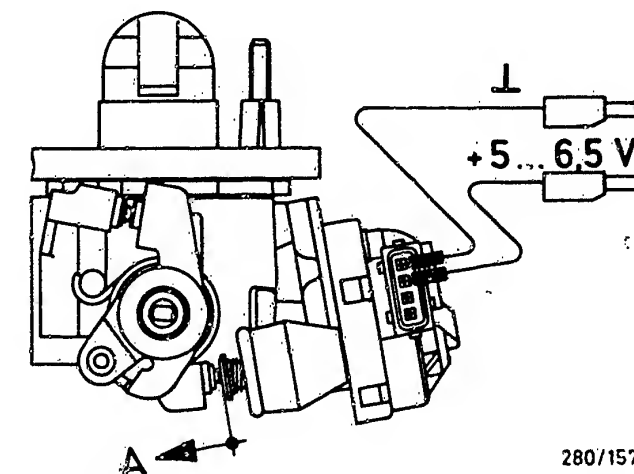
To protect actuator, do not attach connector.

Following installation, the assignment of the throttle valve to the actuator must be set by way of voltage measurement.

Adjustment specification:

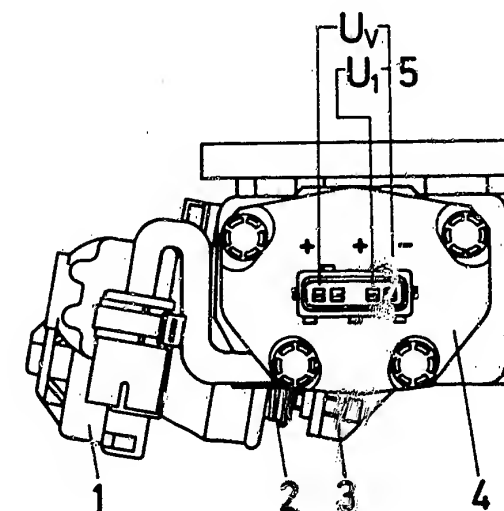
Use test leads KDUM 0008.

- * Fully extend adjusting shaft of actuator. To do so, activate actuator with 5...6.5 volts with correct polarity at both upper connectors (top picture). In doing so, deflect throttle-plate lever somewhat by hand.
- * Push back rubber sleeve at connector of throttle-valve potentiometer. Connect up voltmeter for U_1 measurement (bottom picture). Switch on ignition.
- * Unscrew assignment screw using 3 mm ball-head screwdriver until there is just no further change in potentiometer voltage U_1 .
- * Screw in assignment screw by half a turn. Measure voltage U_1 (to two decimal places) and record measured value.
- * Measure supply voltage U_V (bottom picture) and record measured value (to two decimal places).



A = Extend actuator

- 1 = Throttle-valve actuator
- 2 = Adjusting shaft
- 3 = Assignment screw
- 4 = Throttle-valve potentiometer
- 5 = Voltage measurements for assignment of actuator



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

- * If U_1 is within tolerance (see adjacent diagram, entire cross-hatched area), continue with next item: testing idle switch.

If U_1 is smaller, screw in assignment screw until U_1 is within the lower - more closely cross-hatched - area of the diagram. Continue with next item, testing idle switch.

If U_1 is larger, repeat adjustment from the start.

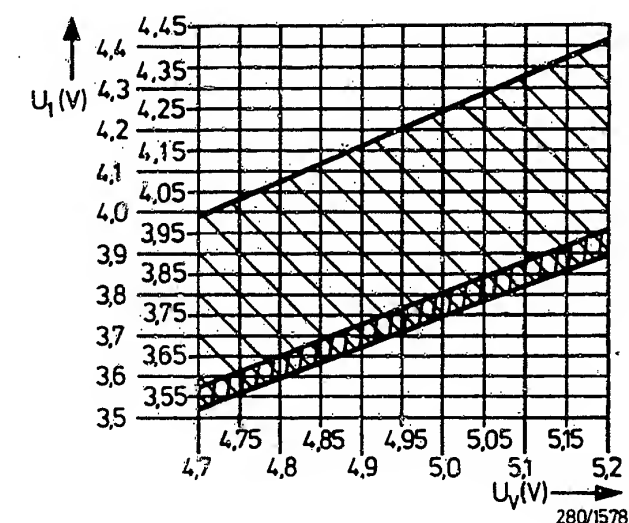
If U_1 still remains too large, renew complete throttle-valve section.

- * Test idle switch, switch off ignition.
- * Connect ohmmeter to both lower plugs of actuator (bottom picture). Reading approx. 0 ohms.
- * Completely retract adjusting shaft of actuator. To do so, activate actuator with correct polarity with 5...6.5 volts (bottom picture). If the reading is approx. infinity ohms, the test is complete. Continue with next item.

If the idle switch does not open, repeat adjustment from the start.

If the idle switch still does not open, the complete throttle-valve section is to be renewed.

- * Finally, secure assignment screw of throttle-plate lever with yellow locking compound.
- * Attach connector to throttle-valve actuator. Slip rubber sleeve into position at throttle-valve potentiometer. Allow engine to run.

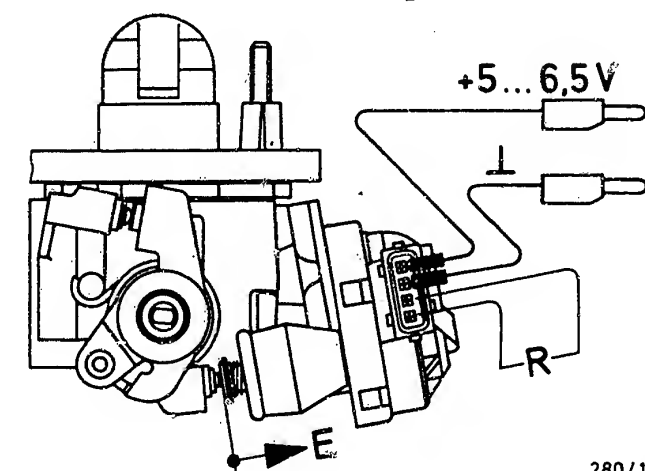


U_v = Supply voltage

U_1 = Potentiometer voltage

E = Retract actuator

R = Resistance of idle switch



280/1579

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removal and installation of throttle-body injection unit.

Removal:

Remove air filter.
Detach 3 multiple connectors.
Loosen and remove intake-manifold-pressure hoses.
Loosen and detach fuel inlet and return hose.
Disengage throttle-valve cable/accelerator linkage.
Loosen and remove 4 fastening screws.
Detach injection unit from intake manifold and set down carefully.
Take care not to damage attachment surface and idle actuator.
Caution: Protect intake manifold against contamination.

Installation:

Place new seal (engine manufacturer) on intake-manifold attachment surface.
Place injection unit in proper position in intake manifold.
Screw in 4 fastening screws, tightening torque 8...9 Nm.
Connect up all hoses. Pay attention to leaks.
Attach 3 multiple connectors.
Place throttle-valve cable/accelerator linkage in position.
Attach air filter.
Run engine.

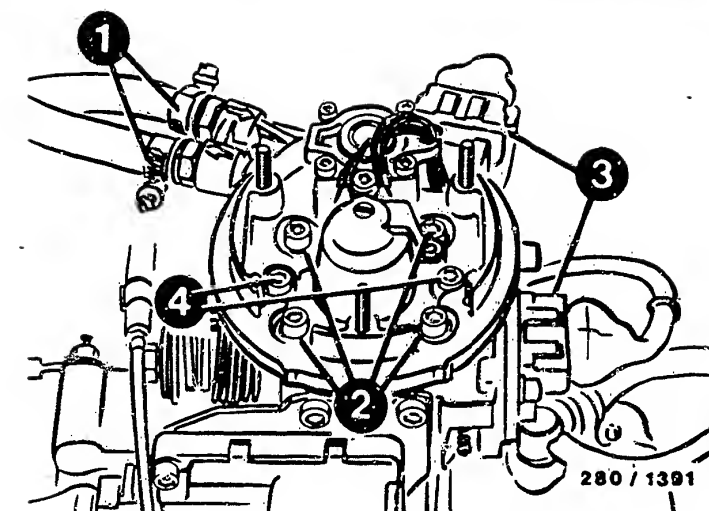
Removal and installation of hydraulic section.

Removal:

Remove air filter. Detach multiple connector.
Loosen and remove fuel inlet and return hose.
Loosen and remove 4 fastening screws.
Unscrew 2 connecting screws to throttle-valve section, or squeeze 2 clips together with newer version.
Remove hydraulic section from throttle-valve section.
Take care not to damage clamping surface and insulating seal.

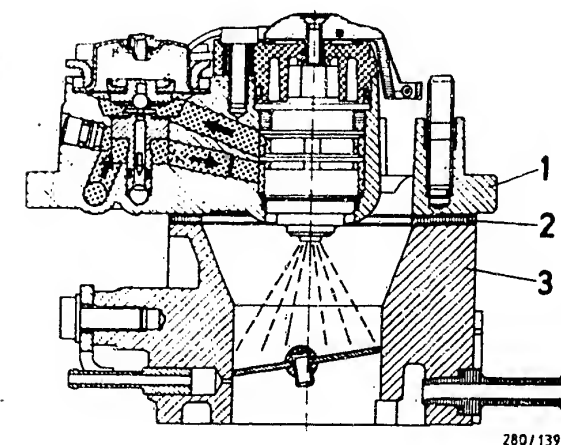
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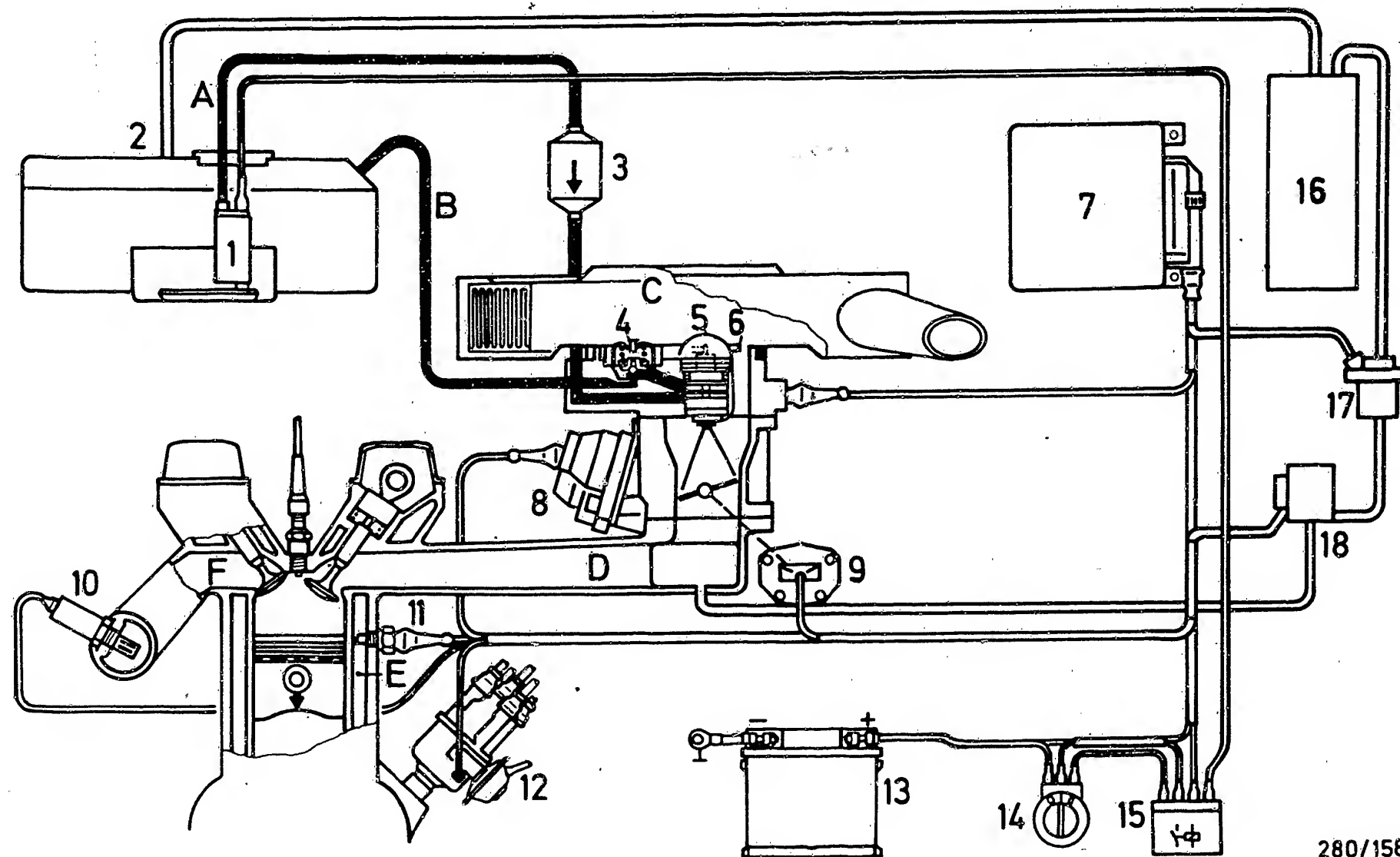
Place new insulating seal in correct position on throttle-valve section.
Place hydraulic section in correct position, engage clips (new version). Seal holes if clips defective.
Clean 2 connecting screws and apply a small quantity of locking compound (Loctite) (earlier version).
Screw in connecting screws, tightening torque 5.5...6.5 Nm.
Screw in 4 fastening screws, tightening torque 8...9 Nm.
Connect up hoses and attach multiple plug.
Attach air filter, run engine.



- 1 = Fuel inlet and return hoses
- 2 = 4 fixing screws
- 3 = Multiple plug
- 4 = Connecting screws

- 1 = Hydraulic section
- 2 = Insulating seal
- 3 = Throttle-valve section





280/1580

- | | | |
|---------------------------------------|----------------------------------|--|
| 1 = Electric fuel pump | 8 = Throttle-valve actuator | 16 = Active-carbon container |
| 2 = Fuel tank | 9 = Throttle-valve potentiometer | 17 = Tank-ventilation frequency valve |
| 3 = Fuel filter | 10 = Lambda sensor | 18 = Tank-ventilation switching valve— |
| 4 = Pressure regulator | 11 = Temperature sensor (engine) | A = Fuel pressure |
| 5 = Solenoid-operated injection valve | 12 = Ignition distributor | B = Return, depressurized |
| 6 = Temperature sensor (intake air) | 13 = Battery | C = Atmospheric pressure |
| 7 = Control unit | 14 = Ignition/starting switch | D = Pressure in intake manifold |
| | 15 = Pump relay | E = Coolant |

DIAGRAM OF AIR AND FUEL LINES

When trouble-shooting, it should be taken into account that additional systems or components such as brake servo-unit cylinders, central locking, tank ventilation or vacuum headlight-aim control may be connected to the intake manifold and thus represent additional sources of faults.

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts with Coordinate B03 and contains customer complaint (fault symptom/fault characteristic feature) together with several possible causes in each case (component faults) and coordinate information for detailed trouble-shooting. If no coordinates are given, this is because the causes concerned do not require any test instructions.

Components, which are tested by way of self-diagnosis or using the universal test adapter, are not indicated in the trouble-shooting chart.

In the event of a clearly established customer complaint, proceed consecutively and step by step as indicated in the trouble-shooting instructions in the stated sequence of possible causes.

Trouble-shooting should always be commenced with self-diagnosis (if provided) or with the universal test adapter (if envisaged). Only then should trouble-shooting be continued in line with the trouble-shooting chart.

In the event of a customer complaint which is not clear-cut, all causes indicated in the trouble-shooting chart must be tested. In order to avoid incorrect measurements, all causes are to be checked in the specified sequence (on account of interlinkage of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component tests indicated in the trouble-shooting chart. It is sub-divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/connection diagrams linked to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be applied and the tests performed in the sequence indicated there.

Following fault elimination, repeat test as a check.

TEST PREREQUISITES:

- Battery fully charged
- Engine in proper mechanical working order (e.g. compression, valve clearance etc.)
- Engine at operating temperature of approx. +80°C (if necessary)
- Proper connection of all connectors of wiring harness
- Ignition system O.K.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on.
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

								Cause (component fault)	Coord.
*	*	*	*	*	*	*	*	Universal test adaption	B 01
*	*	*	*	*	*	*	*	Self-diagnosis	C 19
*	*	*	*		*			Air intake system	D 23
				*	*			Fuel delivery	D 25
*	*	*	*		*	*	*	Fuel pressure, leaks	D 27
		*		*	*	*	*	Solenoid-operated inj.valve	E 05
				*				Alternator, interfer. supp.	E 07
*	*	*			*			Start control	E 09
				*	*			Overrun cutoff	E 11
		*	*	*	*			Engine-speed, CO adjustment	E 15
		*	*	*		*		Lambda closed-loop control	E 17
				*				Exhaust-gas catalytic conv.	E 21
		*	*			*		Tank ventilation	E 23

HOW TO USE TEST CHART FOR UNIVERSAL TEST ADAPTER

- * Before testing, check all multiple plug-in connections for loose contacts.
- * Clean soiled or corroded plug contacts.
- * Look out for receptacles which are pushed back. If necessary, bend back locking lug and press receptacle into plug housing to the stop; locking lug latches home.
- * Suspicion of cable break (positive or negative conductor) at kinked or pinched points.

Connect adapter lead.

The peripherals are tested, and, if provision is made, also the control unit.

A multimeter for the measurement of voltage and resistance and/or a motortester is to be connected to the universal test adapter for the detection of measured values.

The test must always be carried out in full, starting at test step 1, in the specified sequence.

TEST SEQUENCE:

1. The individual test steps follow on from each other.
Example: if in one test step the ground connection for the control unit is tested, this test is not repeated again in the further test steps.
2. If the set value is not obtained in a test step, after rectification of the fault the test step must be repeated.

Note:

In the following test steps, the additionally boxed-in sections of the text indicate which operation is to be changed in comparison with the preceding test step.

Component/function:

Ignition signal, leads/
term.1 or TD engine-speed
signals to control unit.

N>

* Operation:	Position
Program switch "V"	5
Program switch "Ω"	—
Test button	—

* Measuring instrument:
Ignition oscilloscope

* Measuring range:
Special input
Control lever, left.
Measuring range 20V

* Connection:
Test recesses

* Triggering of function on vehicle:
Ignition "On" and start

* Set values (reading):
Ignition pulses/rectangular
pulses, voltage magnitude
at least 80 % of battery
voltage.

Are pulses present?

Trouble-shooting:

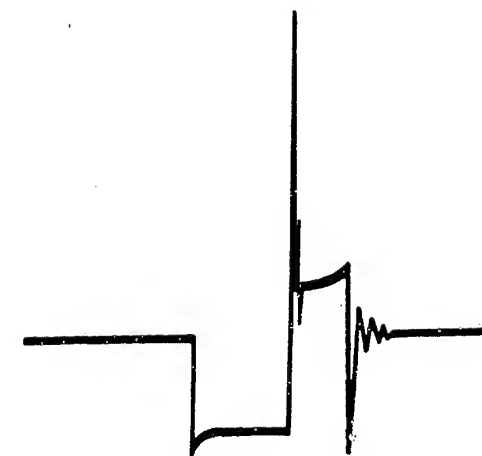
For testing, disconnect
control-unit plug from test
adapter.

Check the following leads
for continuity with ohmmeter,
Set value approx. 0 Ω :

- * From control-unit plug term. 1
to ignition coil term. 1
- * In case of TD signal, from
control-unit plug term. 1 to
ignition control unit.

If leads O.K., check ignition
system.

Eliminate open circuits/
contact resistances.



261/0212

Term. 1 signal from term. 1
ignit. coil (primary signal)

TD signal from ignition
trigger box.



280/0831

Continued on next picture page

Component/function:

Voltage supply to control unit (term.30)

N>

* Operation:

	Position
Prog.-sel. switch " V "	6
Prog.-sel. switch " D "	—
Test button	—

* Measuring equipment:

Motortester or multi-meter

* Measuring range:

approx. 20V

* Connection:

Red measuring socket (+)

Black measuring socket (-)

* Operation in vehicle:

* Set value (reading):

8...15 V

Measured value within set-value tolerance?

* Trouble-shooting:

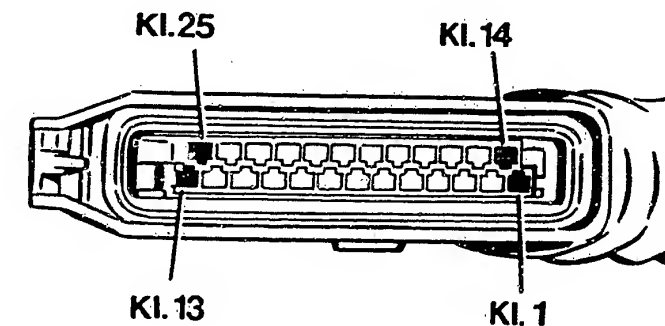
For testing, detach control-unit plug from test adapter.

Check following lead with with ohmmeter for continuity, set value approx. 0 Ω :

* From control-unit plug term.4 to battery (+).

* From control-unit plug term.5 to vehicle ground.

Eliminate open circuits/contact resistances.



227 / 321

Top view of control-unit plug

Component/function:

Voltage supply of control unit.

N>

* Operation:	Position
Program switch "V"	7
Program switch "Ω"	—
Test button	—

* Measuring instrument:

Engine tester or multimeter

* Measuring range:

Approx. 20V

* Connection:

Test socket, red (+)
Test socket, black (-)

* Triggering of function on veh.:
Ignition "ON"* Set value (reading):8...15 V

Is measured value within set value tolerance?

Trouble-shooting:

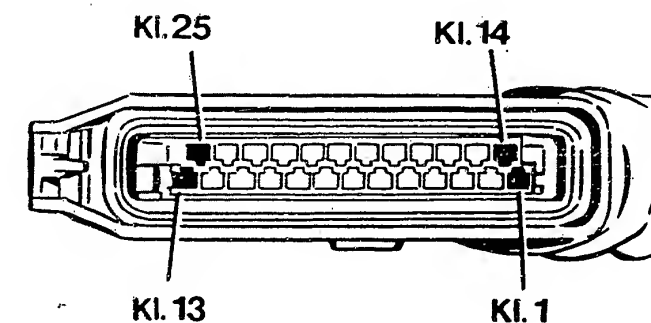
For testing, detach control-unit plug from test adapter.

Use ohmmeter to check following lead for continuity, set value approx. 0 Ω :

- * From control-unit plug term.9 to ignition/starting switch term.15.

- * Check voltage supply at control-unit plug term.9 and term.5.
With ignition "On": 8...15V
If not, check ignition/starting switch and lead term.30 to battery (+).

Eliminate open circuit/contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:
Simulation of energization
of electric fuel pump

N>

* Operation:	Position
Prog.-sel. switch "V"	8
Prog.-sel. switch "Ω"	—
Test button	3

* Measuring equipment:

* Measuring range:

* Connection:

* Operation in vehicle:
Ignition "ON"

* Set value (reading):
Electric fuel pump must operate,
check by listening.

Is electric fuel pump
running?

Trouble-shooting:

For testing, disconnect
control-unit plug from test
adapter.

Measure voltage at pump
relay term. 30 to vehicle
ground.

Set value: 8...15V

If not, check the following
leads for continuity with
ohmmeter

Set value approx. 0 Ω .

* Check lead term. 30 from
pump relay to battery for
continuity.

If lead O.K. => replace
pump relay.

Measure voltage directly
at electric fuel pump.

Connect test adapter.

Press test button 3.

Set value: 8...15 V

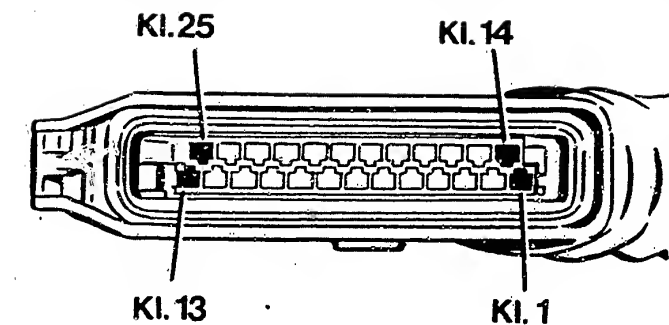
If not, check the following
leads for continuity with
ohmmeter

Set value approx. 0 Ω .

* From electric fuel pump to
pump relay term. 87.

* From electric fuel pump to
vehicle ground.

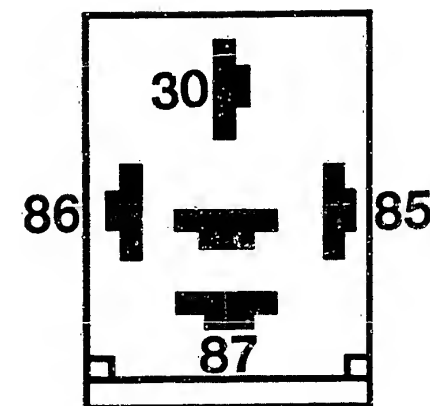
If leads O.K. => replace
electric fuel pump.



227 / 321

Top view of control-unit plug

Top view of connection
base.



280 / 0936

Continued on next picture page

Component/function:

Winding and voltage supply (+) to pump relay

* Operation:

	Position
Prog.-sel. switch " V "	8
Prog.-sel. switch " Ω "	—
Test button	—

* Measuring equipment:

Motortester or multi-meter.

* Measuring range:

approx. 20V

* Connection:

Red measuring socket (+)

Black measuring socket(-)

* Operation in vehicle:

Ignition "ON"

* Set value (reading):

8...15 V

Is measured value within set-value tolerance?

N>

Trouble-shooting:

For test purposes, detach control-unit plug from test adapter.

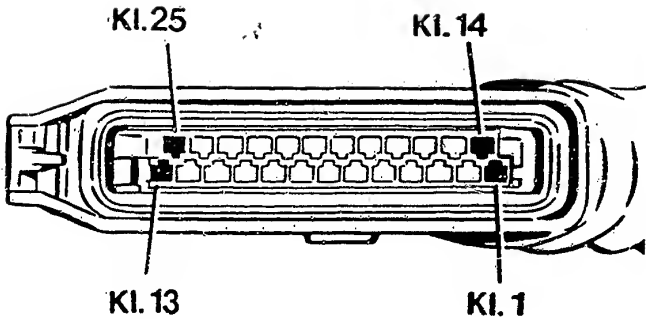
Use ohmmeter to check following leads for continuity,
Set value approx. 0 Ω :

* From control-unit plug term.17 to pump relay term.85.

* From pump relay term.86 to ignition/starting switch term.15.

If leads O.K., renew pump relay.

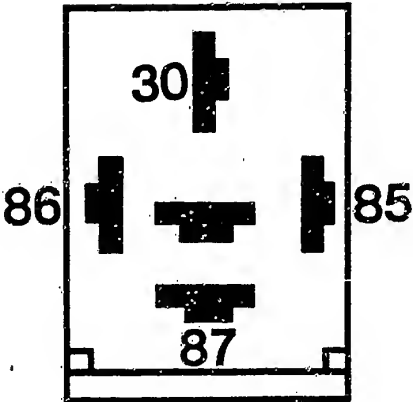
Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Top view of connection base.



280 / 0936

Component/function:

Air conditioning ready for operation (if fitted)

N>

* Operation:	Position
Prog.-sel. switch "V"	9
Prog.-sel. switch "Ω"	—
Test button	—

* Measuring equipment:

Motor tester or multi-meter

* Measuring range:

approx. 20V

* Connection:

Red measuring socket (+)
Black measuring socket (-)

* Operation in vehicle:

Ignition "ON"
Switch on air conditioner

* Set value (reading):

8...15 V

Is measured value within
set-value tolerance?

Trouble-shooting:

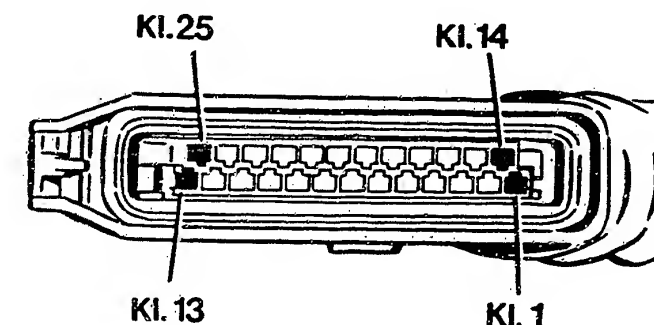
For testing, detach control-unit plug from test adapter.

Check following lines for continuity with ohmmeter,
set value 0 Ω ;

+ From control-unit plug term 15 to air-conditioner switch.

If leads are O.K., check air-conditioner switch.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Air-conditioner compressor
(if fitted)

N>

* Operation:	Position
Prog.-sel. switch "V"	10
Prog.-sel. switch "Ω"	—
Test button	—

* Measuring equipment:
Motortester or multi-meter

* Measuring range:
approx. 20V

* Connection:
Red measuring socket (+)
Black measuring socket (-)

* Operation in vehicle:
Ignition "ON"
Switch on air-conditioner

* Set value (reading):
8...15 V

Is measured value within
set-value tolerance?

Trouble-shooting:

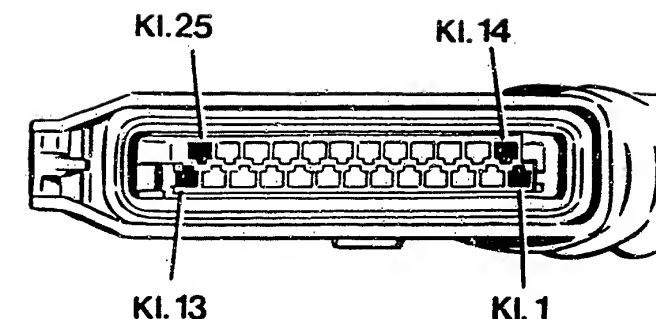
For testing, detach control-unit plug from test adapter.

Check following leads for continuity with ohmmeter,
set value 0 Ω :

- * From control-unit plug term. 16 to air-condition compressor.

If leads are O.K., check compressor switch.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Tank-ventilation valve
(if fitted)

N>

* Operation:	Position
Prog.-sel. switch "V"	12
Prog.-sel. switch "Ω"	—
Test button	4

* Measuring equipment:
Motortester or multi-meter

* Measuring range:
approx. 20V

* Connection:
Red measuring socket (+)
Black measuring socket (-)

* Operation in vehicle:
Ignition "ON"

* Set value (reading):
Tank-ventilation valve must
respond, check by listening

Is measured value within
set-value tolerance?

Trouble-shooting:

For test purposes, detach
control-unit plug from test adapter.

Measure resistance directly at
tank-ventilation frequency valve.
Refer to brief instructions for set
value.

If set value is not attained,
renew tank-ventilation
frequency valve.

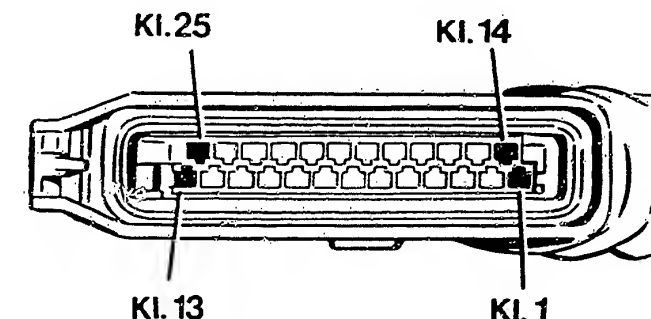
Use ohmmeter to test following
leads for continuity.

Set value approx. 0 Ω :

- * From control-unit plug
term.12 to tank-ventilation
frequency valve.
- * From tank-ventilation
frequency valve to
ignition/starting switch term.15.

If leads O.K., renew tank-
ventilation frequency
valve.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

TEST STEP 9

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/function:

Spark-advance valve (if fitted)

N>

* Operation:	Position
Prog.-sel. switch " V "	13
Prog.-sel. switch " Ω "	—
Test button	—

* Measuring equipment:
Motortester or multi-meter

* Measuring range:
approx. 20V

* Connection:
Red measuring socket (+)
Black measuring socket (-)

* Operation in vehicle:
Ignition "ON"
Depress accel. pedal slightly

* Set value (reading):
8...15 V

Is measured value within
set-value tolerance?

Trouble-shooting:

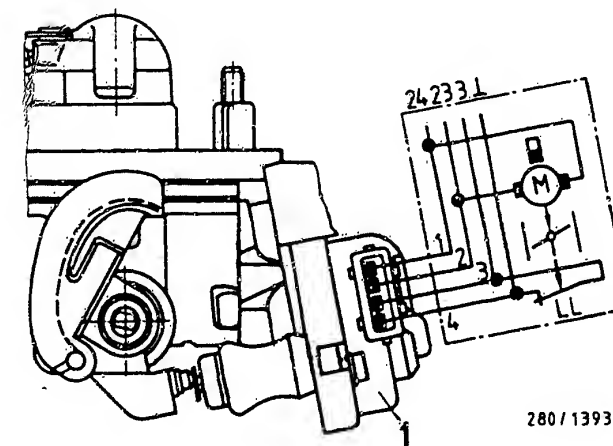
Detach control-unit plug
from test adapter.

Check following leads
for continuity with
ohmmeter,
set value approx. 0 Ω :

- * From spark-advance valve
to idle switch term.3
- * From spark-advance valve to
ignition and starting switch
term.15

If leads are O.K., replace
spark-advance valve.

Eliminate open circuits/
contact resistances.



280/1393

1 = Throttle-valve actuator

Continued on next picture page

Component/function:

Diagnostic display (if fitted)

N>

* Operation:	Position
Prog.-sel. switch " V "	==>
Prog.-sel. switch " Ω "	5
Test button	1

* Measuring equipment:* Measuring range:* Connection:* Operation in vehicle:

Ignition "on"

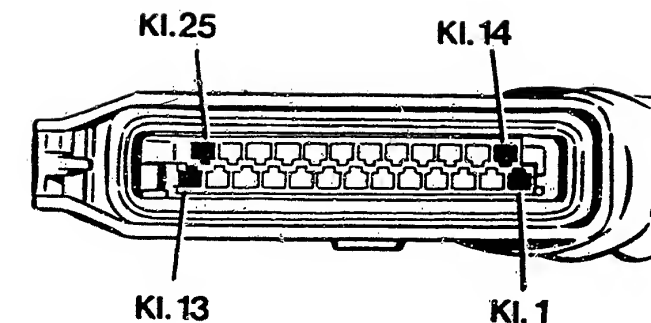
* Set value (reading):Diagnostic lamp lights upTrouble-shooting:

For testing, detach control-unit plug from test adapter.

Check following lead for continuity with ohmmeter, set value 0 Ω :

- * From control-unit plug term.22 to diagnostic lamp
- * From diagnostic lamp to ignition and starting switch term.15

If leads are O.K., replace diagnostic lamp.

Eliminate open circuits/
contact resistances.

227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:
Resistance of idle
contact.

N>

Operation:	Position
Prog.-sel. switch "V"	==>
Prog.-sel. switch "Ω"	7
Test button	—

* **Measuring equipment:**
Motortester or multi-
meter

* **Measuring range:**
x 10 Ω

* **Connection:**
Measuring sockets, ohms,
blue

* **Operation in vehicle:**
Accel. pedal at idle

* **Set value:**
0...10 Ω

* **Operation in vehicle:**
Depress acc. pedal slightly

* **Set value:**
infinite Ω

Is measured value within
set-value tolerance?

V

Continued on next picture page

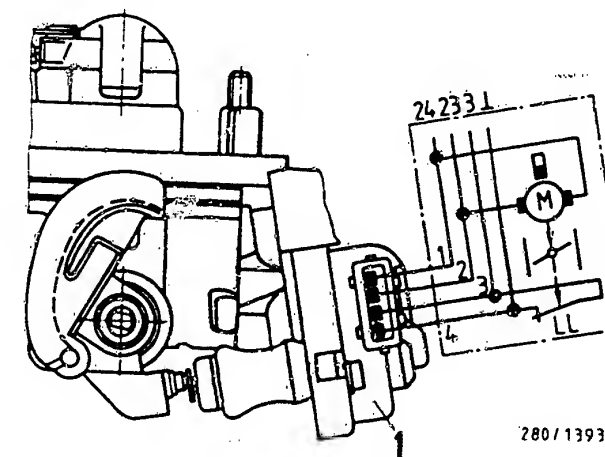
* **Trouble-shooting:**
Prerequisite: stop screw
(minimum stop) of throttle
valve correctly set.

Adjustment carried out at
factory, screw permanently
set and secured against
turning.
Set accelerator cable/linkage
such that there is no tension.
Renew if kinked.

For test purposes, detach
control-unit plug from
test adapter.
Connect ohmmeter to plug of
throttle-valve actuator at
term.3 and term.4.
Accelerator cable in idle position,
set value approx. 0 Ω.
Tighten accelerator cable somewhat,
set value infinity Ω.
If not, renew throttle-valve
actuator.
See Coordinate A21

Use ohmmeter to check following
leads for continuity,
set value approx. 0 Ω :
* From idle contact term.3
to control-unit plug term.3
* From idle contact term.4
to engine ground.

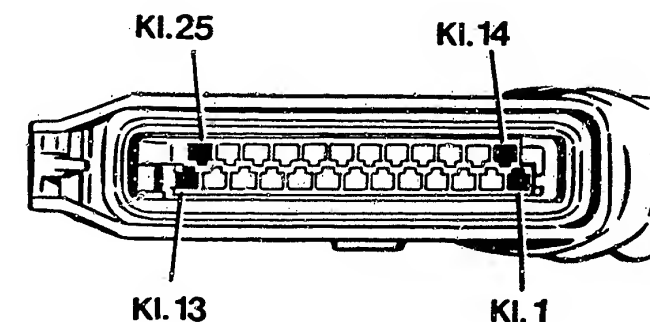
Eliminate open circuits/
contact resistances.



280 / 1393

1 = Throttle-valve actuator

Top view of control-unit plug



227 / 321

Component/function:

Function of transmission switch
(if provided),
or ground connection

N>

* Operation:	Position
Program switch "V"	→
Program switch "Ω"	8
Test button	—

* Measuring instrument:

Engine tester or
multimeter

* Measuring range:

x 10 Ω

* Connection:

Test socket, ohms, blue

* Triggering of function on veh.:

Ignition "OFF" and engage
gear.

* Set value (reading):

0...10 Ω

Is measured value within
set-value tolerance?

Trouble-shooting:

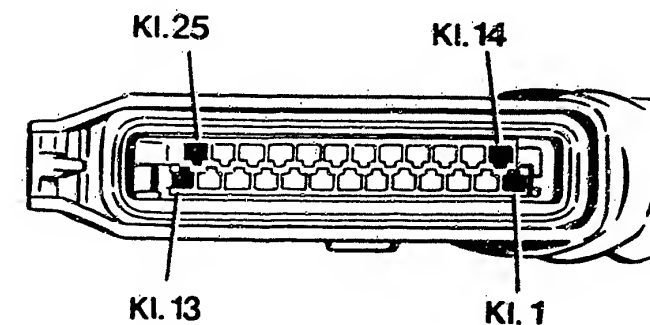
For test purposes, detach
control-unit plug.

Use ohmmeter to check
following lead for
continuity,
set value approx. 0 Ω :

- * With transmission switch,
from control-unit plug
term.6 to transmission switch.
- * From transmission switch
to engine ground.
If leads O.K., renew
transmission switch.

- With ground connection,
* from control-unit plug
term.6 to engine ground.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Connection of t v coding
(if fitted)

N>

* Operation:	Position
Prog.-sel. switch " V "	==>
Prog.-sel. switch " Ω "	9
Test button	—

* Measuring equipment:
Motortester or multi-meter

* Measuring range:
x 10 Ω

* Connection:
Measuring socket Ω blue

* Operation in vehicle:
Connect lead from term.10
to ground.

* Set value (reading):
0...10 Ω

Is measured value within
set-value tolerance?

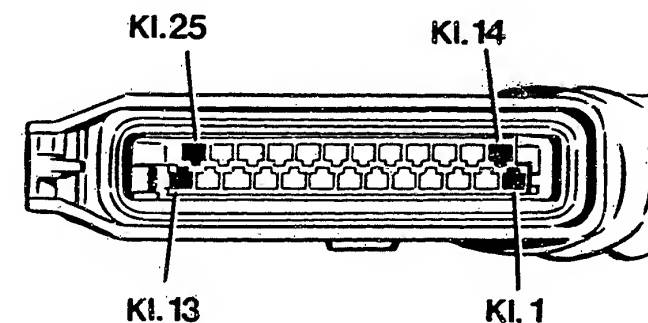
Trouble-shooting:

For testing, detach
control-unit plug.

Check following lead
for continuity with
ohmmeter,
set value approx. 0 Ω :

* From control-unit plug
term.10 to end of lead

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Connection of pump encoding
(if provided)

N>

* Operation:	Position
Program switch " V "	—
Program switch " Ω "	10
Test button	—

* Measuring instrument:

Engine tester or
multimeter

* Measuring range:

x 10 Ω

* Connection:

Test socket, ohms, blue

* Triggering of function on veh.:
not applicable* Set value (reading):

0...10 Ω

Is measured value within
set-value tolerance?

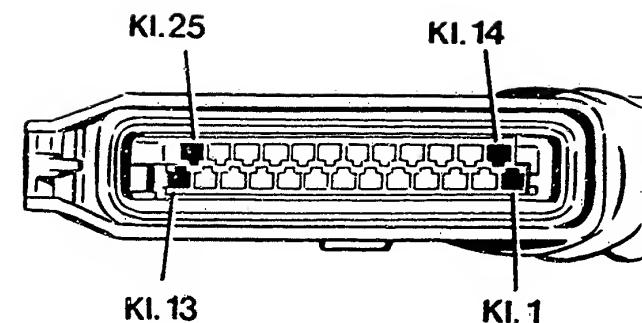
Trouble-shooting:

For test purposes,
detach control-unit plug.

Use ohmmeter to check
following lead for
continuity,
set value approx. 0 Ω :

- * From control-unit plug
term.11 to engine ground.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Resistance of temperature sensor (intake air)

N>

* Operation:	Position
Program switch " V "	==>
Program switch " Ω "	11
Test button	—

* Measuring instrument
Engine tester/multimeter

* Measuring range:
approx. 5k Ω or 500 Ω

* Connection:
Test sockets, ohms, blue

* Triggering of function on veh.:
not applicable

* Set value:
at ambient temperature
at temperature sensor
+15...+30°C:
1.45...3.3 k Ω
at approx. +50°C:
700...950 Ω

Is measured value within
set-value tolerance?

Trouble-shooting:

For test purposes, detach
control-unit plug from
test adapter.

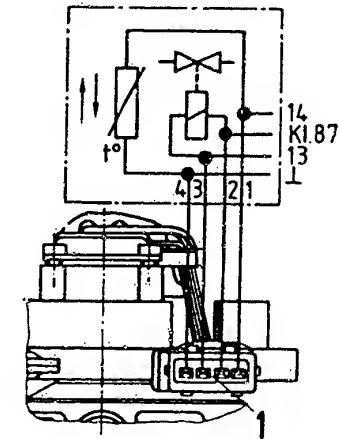
Measure resistance directly
at temperature sensor (intake
air) term.1 and term.4.

Set value:
at ambient temperature
at temperature sensor
+15...30°C:
1.45...3.3 k Ω ,
at approx. +50°C:
700...950 Ω
Renew temperature sensor
if set values are not
attained.
Refer to Coordinate A17

Use ohmmeter to check
following leads for
continuity,
set value approx. 0 Ω :

- * From control-unit plug
term.14 to temperature sensor
(intake air).
- * From temperature sensor
(intake air) to engine
ground.

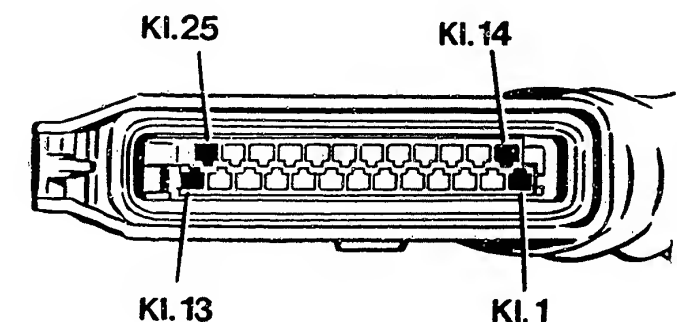
Eliminate open circuits/
contact resistances.



280 / 1394

1 = Multiple plug of solenoid-
operated injection valve
and temperature sensor
(intake air)

Top view of control-unit plug



227 / 321

Continued on next picture page

Component/function:

Resistance of temperature sensor (engine)

N>

* Operation:	Position
Prog.-sel. switch " V "	=>
Prog.-sel. switch " Ω "	12
Test button	—

* Measuring equipment
Motortester or multi-meter

* Measuring range:
approx. 5k Ω or 500 Ω

* Connection:
Measuring sockets, ohms, blue

* Operation in vehicle:
not applicable

* Set value:
At ambient temperature
+15°...+30°C:
1.45...3.3 k Ω

With warmed-up engine
approx. +80° C:
280...360 Ω

Is measured value within set-value tolerance?

Trouble-shooting:

For testing, detach control-unit plug from test adapter.

Measure resistance value directly at temperature sensor (engine).

Set value:

Ambient temperature
+15°...30°C:

1.45...3.3 k Ω

Warmed-up engine

approx. +80°C:

280...360 Ω

If set values are not attained, replace temperature sensor.

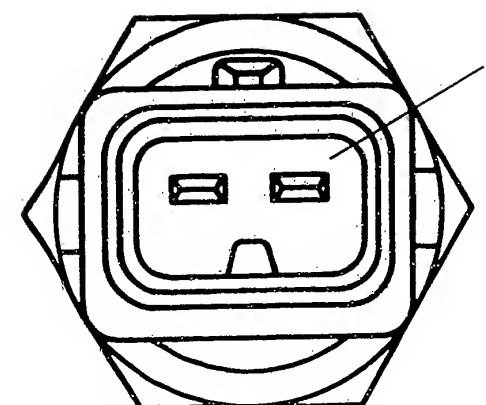
Check following leads for continuity with ohmmeter,

set value approx. 0 Ω :

* From control-unit plug term.2 to temperature sensor (engine).

* From control-unit plug term.5 to temperature sensor (engine).

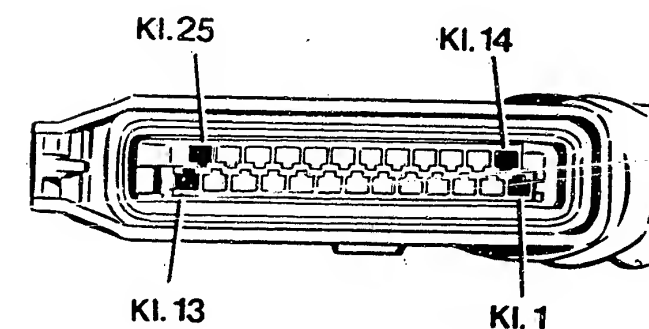
Eliminate open circuits/contact resistances.



780 / 1346

Top view of connector of engine-temperature sensor

Top view of control-unit plug



227 / 321

Continued on next picture page

TEST STEP 17

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/function:

Ground connection of output stage.

N>

* Operation:	Position
Progr. switch "V"	==>
Progr. switch "Ω"	13
Test button	—

* Measuring equipment
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Blue test sockets, ohm

* Operation in vehicle:
Not applicable

* Set value:
0...10 Ω

Is measured value within
set-value tolerance?

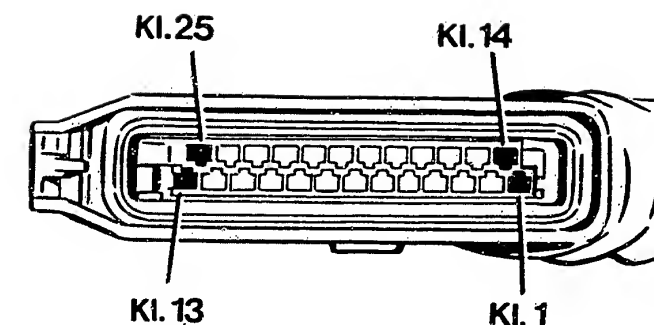
Trouble-shooting:

For test purposes,
detach control-unit plug.

Use ohmmeter to check
following lead for
continuity,
set value approx. 0 Ω :

* From control-unit plug
term.25 to engine ground.

Eliminate open circuits/
contact resistances.



227 / 321

Top view of control-unit plug

Continued on next picture page

Component/function:

Resistance of solenoid-operated injection valve with series resistor.

N>

* Operation:	Position
Program switch " V "	==>
Program switch " Ω "	14
Test button	—

* Measuring instrument
Engine tester/multimeter

* Measuring range:
x 100 Ω

* Connection:
Test sockets, ohms, blue

* Triggering of function on vehicle:
not applicable

* Set value:
6...12 Ω

Is measured value within
set-value tolerance?

Trouble-shooting:

For test purposes, detach control-unit plug from test adapter.

Measure resistance directly at multiple plug of solenoid-operated injection valve.

Ambient temperature
+15°...30°C
Set value: 1.0...1.6 Ω

Renew solenoid-operated injection valve if set value is not attained.
Refer to Coordinate A19

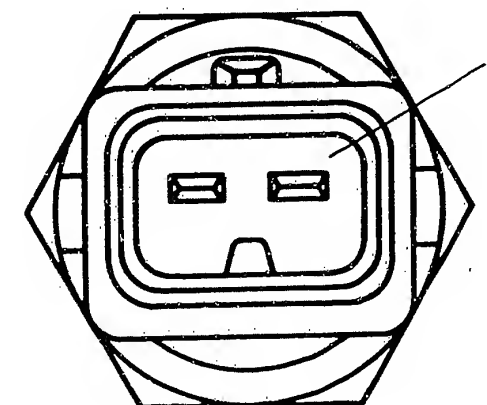
Measure resistance directly at series resistor.
Ambient temperature
+15°...30°C
Set value: 2.5...4 Ω

Renew series resistor if set value is not attained.

Use ohmmeter to check following leads for continuity, set value approx. 0 Ω :

- * From control-unit plug term.13 to solenoid-operated injection valve.
- * From solenoid-operated injection valve to series resistor.
- * From series resistor to pump relay term.87.

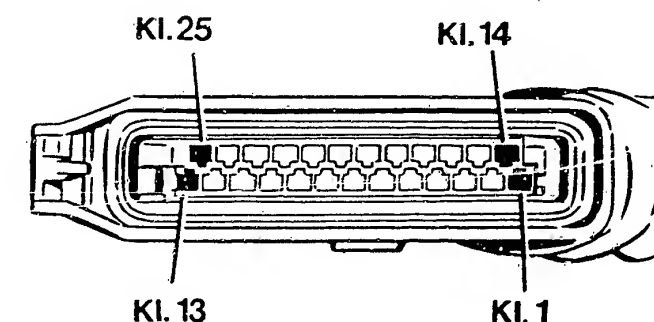
Eliminate open circuits/
contact resistances.



280 / 1346

1 = Multiple plug of solenoid-operated injection valve and temperature sensor (intake air)

Top view of control-unit plug



227 / 321

Continued on next picture page

TEST STEP 19

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/function:

Resistance of throttle-
valve potentiometer

N>

* Operation:	Position
Prog.-sel. switch " V "	==>
Prog.-sel. switch " Ω "	15
Test button	==

* Measuring equipment
Motortester or multi-
meter

* Measuring range:
x 100 Ω

* Connection:
Measuring sockets, ohms, blue

* Operation in vehicle:
not applicable

* Set value:
600...1400 Ω

Is measured value within
set-value tolerance?

Trouble-shooting:

For test purposes, detach
control-unit plug from
test adapter.

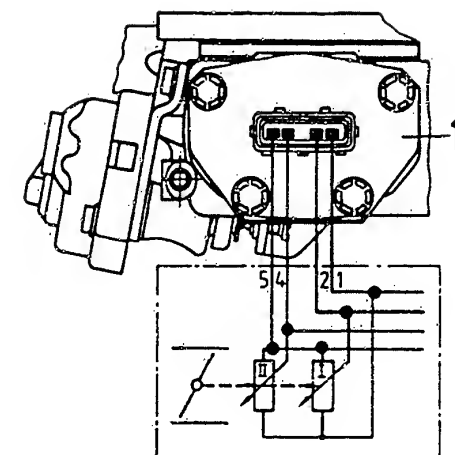
Measure resistance directly
at throttle-valve potentiometer
term.5 and term.1.
Set value: 600...1400 Ω

If set value is not
attained, renew complete
throttle-valve section.
Refer to Coordinate A25.

Use ohmmeter to check
following leads for
continuity,
set value approx. 0 Ω :

- * From control-unit plug
term.8 to throttle-valve
potentiometer term.5.
- * From throttle-valve
potentiometer term.1 to
engine ground.

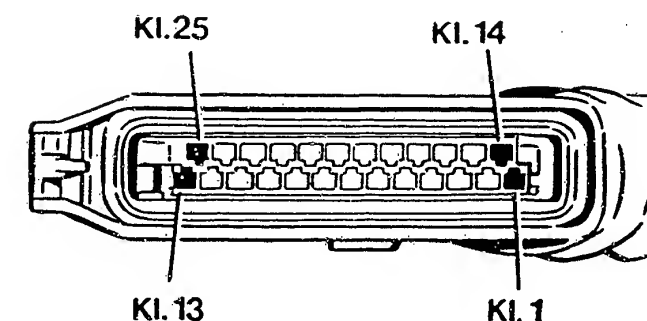
Eliminate open circuits/
contact resistances.



280/1421

1 = Throttle-valve potentiometer

Top view of control-unit plug



227 / 321

Continued on next picture page

Component/function:Resistance of throttle-
valve potentiometer

N>

* Operation:	Position
Prog.-sel. switch " V "	=>
Prog.-sel. switch " Ω "	16
Test button	=

* Measuring equipment
Motortester or multi-
meter

* Measuring range:
x 100 Ω

* Connection:
Measuring sockets, ohms, blue

* Operation in vehicle:
Deflect throttle valve

* Set value:
500...4000 Ω
(Maximum value at part load)

Is measured value within
set-value tolerance?Trouble-shooting:For test purposes, detach
control-unit plug from
test adapter.

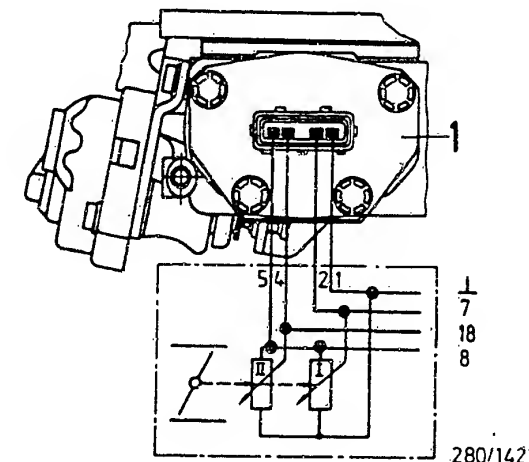
Measure resistance directly
at throttle-valve potentiometer
term.2 and term.4.
Deflect throttle valve.
Set value: 400...4000 Ω
(Max. value at part load).

If set value is not
attained, renew complete
throttle-valve section.
Refer to Coordinate A25.

Use ohmmeter to check
following leads for
continuity,
set value approx. 0 Ω :

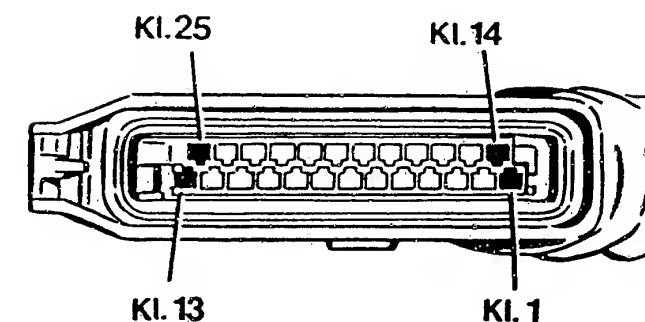
- * From control-unit plug
term.7 to throttle-valve
potentiometer term.2
- * From control-unit plug
term.18 to throttle-valve
potentiometer term.4.

Eliminate open circuits/
contact resistances.



1 = Throttle-valve potentiometer

Top view of control-unit plug



227 / 321

Continued on next picture page

Component/function:

Resistance of throttle-valve actuator

N>

* Operation	Position
Program switch " V "	==>
Program switch " Ω "	20
Test button	—

* Measuring instrument
Engine tester/multimeter

* Measuring range:
 $\times 100 \Omega$

* Connection:
Test sockets, ohms, blue

* Triggering of function
on vehicle:

* Set value:
4...250 Ω

Is measured value within
set-value tolerance?

Trouble-shooting:

For test purposes, detach
control-unit plug from
test adapter.

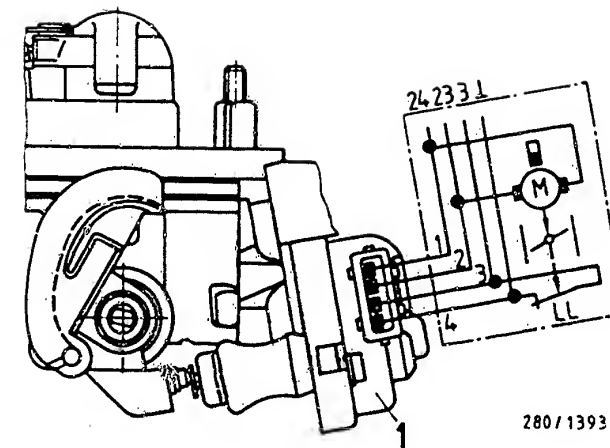
Measure resistance directly
at throttle-valve actuator
term.1 and term.2.
Set value: 4...250 Ω .

Renew throttle-valve
actuator if set value
not attained.
Refer to Coordinate A21.

Use ohmmeter to check
following leads for
continuity,
set value approx. 0 Ω :

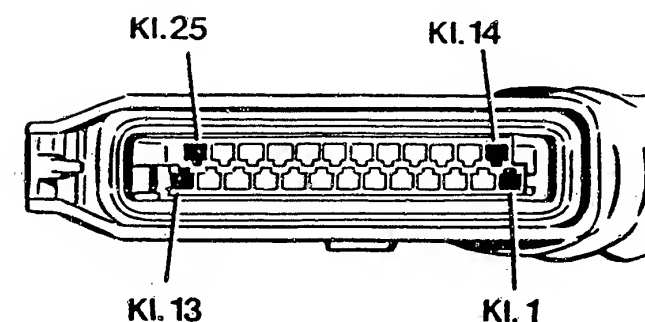
- * From control-unit plug
term.24 to throttle-valve
actuator term. 1.
- * From control-unit plug
term.23 to throttle-valve
actuator term.2.

Eliminate open circuits/
contact resistances.



1 = Throttle-valve actuator

Top view of control-unit plug



Return to trouble-shooting chart
B03

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND TROUBLE-SHOOTING PROGRAM

This vehicle is equipped with a control unit which has a self-diagnosis feature. Therefore, start trouble-shooting with the self-diagnosis.

How to activate the self-diagnosis is described starting on Coordinate C21. The self-diagnosis test table starting on Coordinate C23 contains:

- Fault indication (flashing code)
- Components or system functions under test
- Test instructions/test conditions
- Connection terminals
- Set-value specifications
- Coordinate references for trouble-shooting and fault rectification in the subsequent self-diagnosis trouble-shooting program.

The self-diagnosis trouble-shooting program is split up into 3 columns as of Coordinate C27.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/terminal diagrams belonging to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be employed and the tests performed in the sequence indicated there.

If the self-diagnosis indicates a fault, but there is no system or component fault, the control unit is to be replaced.

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (CONTINUED)

Faults, which occur when driving, are stored in the fault memory of the control unit. Faults of relevance to emissions and safety (Carb faults) are indicated by the diagnosis lamp as long as they are present.

Stored faults are retained even after switching off the ignition.

Flashing-code output by means of diagnosis lamp. A diagnosis lamp (LED), which lights up after switching on the ignition and goes out after starting the engine, is located for this purpose in the dash panel insert. A fault is indicated however if the lamp continues to light up when the engine is running.

The fault memory must be cleared after eliminating all faults.

"Activation of self-diagnosis" and "clearing fault memory" are described on the next Coordinate.

If no further system-specific faults are indicated by the self-diagnosis and the customer complaint (fault symptom) has still not been eliminated, trouble-shooting must be continued with the trouble-shooting chart as of Coordinate B03.

ACTIVATION OF SELF-DIAGNOSIS

Test prerequisite:

- * Voltage supply, positive and negative, of control unit O.K.
Battery positive: to term.4,
Positive of term.15 : to term.9,
Ground: to term. 5 and term.25.
- * Diagnosis lamp (LED) in dash panel insert O.K.
Positive of term.15 : to diagnosis lamp positive,
Ground to diagnosis lamp: from term. 22 of control unit.
- * Diagnosis lead (white/red, next to ignition coil).
Connected to term. 22 of control unit.

Faults are stored in the event of:

- * Test drive of at least 10 minutes duration or
- * If engine won't run, actuate starting motor for approx. 6 seconds.
Do not switch off ignition.

Activation:

- * Switch on ignition or run engine at idle.
- * Connect diagnosis lead (white/red, next to ignition coil) with auxiliary lead to ground for at least 4 s.
Diagnosis lamp starts to flash.

Readout of fault memory:

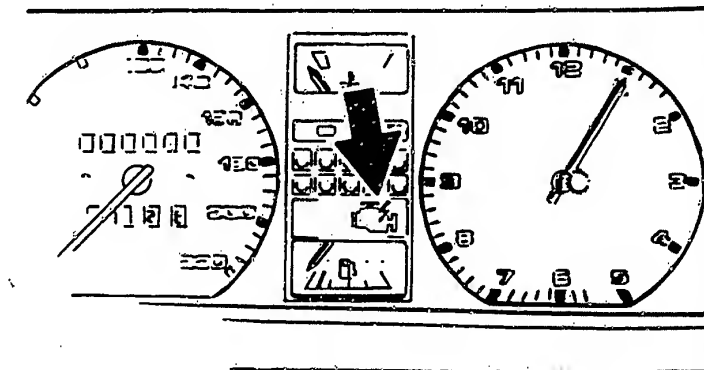
- * Each flashing code consists of 4 flashing-pulse groups with a maximum of 4 flashing pulses. A flashing-pulse group can consist of 1, 2, 3 or 4 flashing pulses.
Pauses of approx. 2.5 s duration occur between the flashing-pulse groups.

Example: pulse sequence || ||| |||| ||
signifies flashing code 2 3 4 2

- * The flashing code is repeated until the ignition is switched off or the engine speed is increased to in excess of 2500 min⁻¹.

Clearing fault memory:

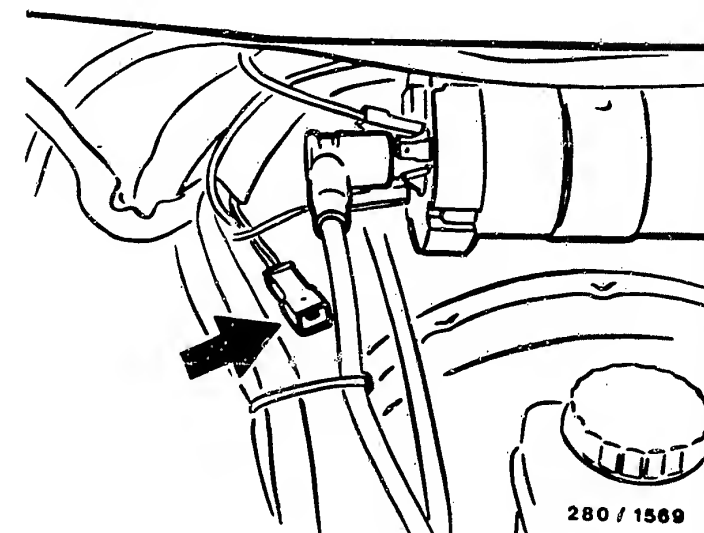
- * With ignition switched off, connect diagnosis lead with auxiliary lead to ground.
- * Switch on ignition and detach ground connection after at least 5 s.



280 / 1568

Arrow = Diagnosis lamp (LED)
in instrument panel

Arrow = Diagnosis lead



280 / 1569

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Term- inals	Set values	Coord.
1 1 1 1	Control unit	Replace control unit without further testing.	—	—	—
2 1 2 1	Idle contact	Assignment screw of throttle-plate lever must close idle contact. For setting see: A21 Check resistance directly at throttle-valve actuator Throttle valve closed: Throttle valve open: Check following leads, from control-unit plug to throttle-valve-actuator idle contact and to ignition timing valve, from idle contact to engine ground.	3 - 4 3 - 3 4-grnd.	0 Ω infinity Ω approx. 0 Ω approx. 0 Ω	D01
2 1 2 2	No engine-speed signal	Check lead from control unit term.1 to ignition coil term.1 or to ignition trigger box term.7. Check term.1 ignition signal or TD rectangular signal with engine tester at control-unit plug term. 1. Check ignition system.	1 - 7 1 - 5	approx. 0 Ω Term.1 primary signal or square-wave voltage min. 80% U-battery	D03
2 2 1 2	Throttle-valve potentiometer	Measure resistance directly at throttle-valve potentiometer: Deflect throttle valve: Check leads from control unit to throttle-valve potentiometer: Lead from potentiometer to engine ground Short circuit to + 5 V.	1 - 5 2 - 4 8 - 5 7 - 2 18 - 4 1-grnd.	600...1400 Ω 400...4000 Ω Maximum at part load approx. 0 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω	D05
2 3 1 2	Temperature sensor (engine)	Measure resistance directly at temperature sensor: at ambient temperature +15...+30°C: with engine at op.temp.approx.+80°C: Check leads from control unit to temperature sensor (NTC).	2 -NTC NTC-grd grnd.-5	1.45...3.3 k Ω 280...360 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω	D07

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Term- inals	Set values	Coord.
2 3 2 2	Temperature sensor (intake air)	Measure resistance directly at 4-fold plug: at ambient temperature +15...+30°C: at approx.+50°C: Check following leads, from control unit term.14 to temp. sensor term.1 from engine ground to temperature sensor term.4	1 - 4 14 - 1 grnd.-4	1.45...3.3 k Ω 700 ...950 Ω approx. 0 Ω approx. 0 Ω	D09
2 3 4 1	Lambda closed-loop control outside working range (control limits exceeded or undershot).	Open circuit in sensor lead or short circuited to ground or batt. volt. Look out for worn insulation. Check sensor heater, resistance: supply voltage:	20	1...15 Ω 8...15 V	D11
2 3 4 3	Lambda closed-loop control has reached adaption limits.	Sensor ceramics clogged. Intake system leaking. Tank ventilation valve constantly open. Injection valve defective, check resistance: Check fuel pressure, set value:		1.0...1.6 Ω see brief instructions.	
2 3 4 2	Lambda sensor	Open circuit in sensor lead or short circuited to ground or batt. volt. Watch out for worn insulation. Sensor ceramics clogged. Check sensor heater, resistance: supply voltage:	20	1...15 Ω 8...15 V	D17
4 4 3 1	Throttle-valve actuator	Measure resistance directly at 4-fold plug: Check following leads, from control-unit plug term.24 to actuator term.1 from control-unit plug term.23 to actuator term.2 Control unit defective.	1 - 2 24 - 1 23 - 2	Less than 250 Ω approx. 0 Ω approx. 0 Ω	D21
4 4 4 4	No fault stored	Continue trouble-shooting in accordance with trouble-shooting chart			B 03
0 0 0 0	End of fault output	If necessary, continue trouble-shooting in accordance with trouble-shooting chart.			B 03

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (1)

SELF-DIAGNOSIS FLASHING CODE 1111

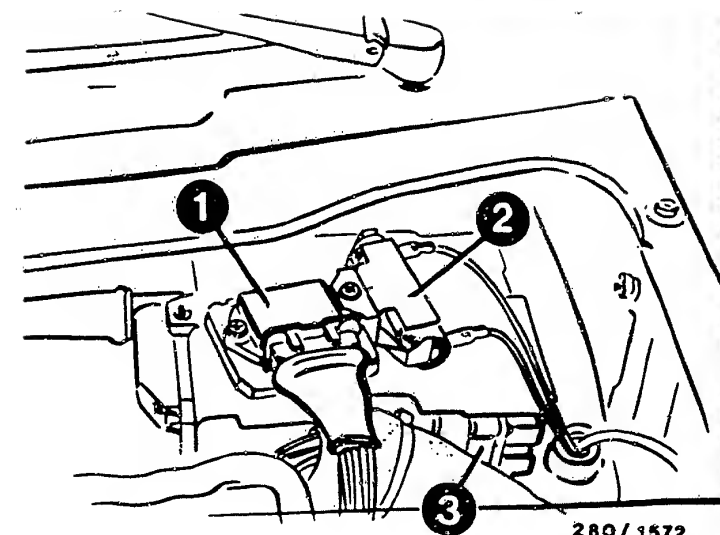
Check control unit.

No further testing of control unit necessary.

Flashing code not present?

Renew control unit.

The control unit is on the left in the plenum chamber beneath a cover plate.



- 1 = TIH ignition trigger box
- 2 = Series resistor for injection valve
- 3 = Monojetronic control unit

Return to self-diagnosis test table C23

C27

C28

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2)

SELF-DIAGNOSIS FLASHING CODE 2121

Check idle contact

Detach plug from throttle-valve actuator.
Measure resistance directly at actuator directly between term.3 and term.4.

Set values,
throttle valve
closed: 0 Ω
Throttle valve
open: infinity Ω

Are set values attained?

N>

Trouble-shooting:

*Prerequisite: stop screw (minimum stop) of throttle valve correctly set. Setting was performed at factory, screw is permanently set and secured to stop it turning.

*Assignment screw of throttle-plate lever must close idle contact.
For setting see: A21
If idle contact is defective, renew complete throttle-valve actuator. See: A21

*Set accelerator cable/linkage such that there is no tension.
*Renew if kinked.

Adjustment check:
Tighten accelerator cable somewhat. The idle contact opens.
Reading: infinity Ω .

Detach control-unit plug.
Use ohmmeter to check following leads for continuity, set value approx. 0 Ω :

*From throttle-valve actuator term.3 to control-unit plug term.3
*From throttle-valve actuator term.3 to ignition timing valve.
*From throttle-valve actuator term.4 to engine ground.

Is set value attained?

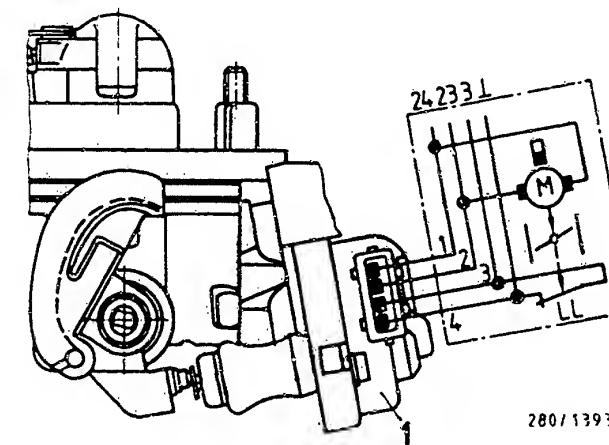
N>

Trouble-shooting:

*Watch out for worn insulation and loose contacts.
*Eliminate open circuits/contact resistances.

Attach plug to control unit and throttle-valve actuator.

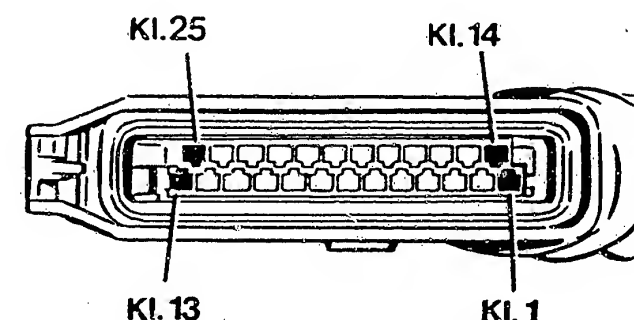
Return to self-diagnosis test table C23



280 / 1393

1 = Throttle-valve actuator

Top view of control-unit plug



227 / 321

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3)

SELF-DIAGNOSIS FLASHING CODE 2122

No engine-speed signal.

Detach control-unit plug.

Measure term.1 ignition signal
or TD rectangular signal
with ignition oscilloscope.
Set to special input.
Lever on left stop
(calibrated voltage range).

Connect red tester terminal
to control-unit plug term.1,
black tester terminal to
engine ground.

Start engine

Set value:
See pictures,
term.1 primary signal or square-
wave voltage, voltage stroke
at least 80% U-battery.

Is set value attained?

N>

Detach control-unit plug.

Use ohmmeter to test following lead
for continuity.

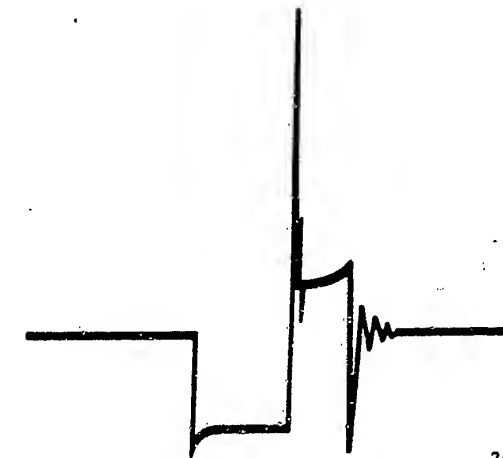
Set value: approx. 0 Ω

From control-unit plug term. 1
to ignition coil term. 1

With TD signal from control-unit
plug term. 1 to ignition control
unit term. 7.

If leads are O.K., check ignition
system.

Repair faulty lead or plug.



261/0212

Term. 1 signal from term. 1
ignit. coil (primary signal)

TD signal from ignition
trigger box.



280/0831

Attach control unit
plug.

Return to self-diagnosis
test table C23

D03

<=>

D04

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4)

SELF-DIAGNOSIS FLASHING CODE 2212

Check throttle-valve potentiometer.

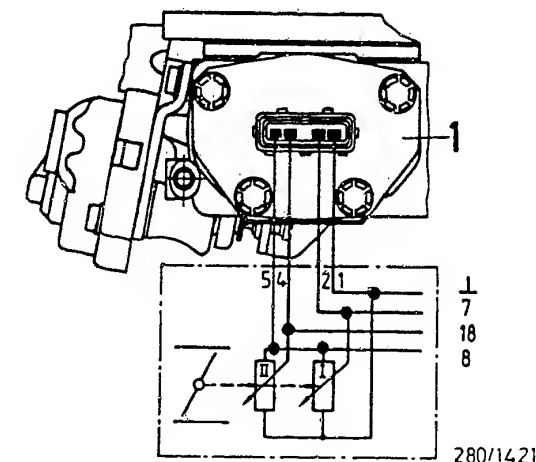
Detach plug from throttle-valve potentiometer.
Measure resistance directly at potentiometer.

Set values between,
term.1 and term.5: 600...1400 Ω
term.2 and term.4: 400...4000 Ω
Deflect throttle valve
(Maximum value at part load).

Are set values attained?

N>

Trouble-shooting:
*Renew complete throttle-valve section if set value is not attained.
Refer to Coordinate A25.



1 = Throttle-valve potentiometer

Detach control-unit plug.
Use ohmmeter to check following leads for continuity,
set value approx. 0 Ω :

*From control-unit plug to throttle-valve potentiometer:
term. 7 to term.2
term. 8 to term.5
term. 18 to term.4

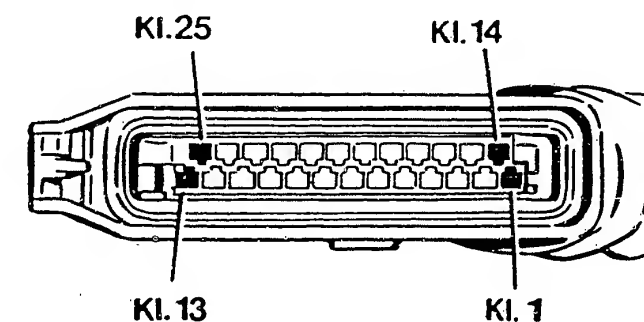
*From throttle-valve potentiometer term.1 to engine ground.

Is set value attained?

N>

Trouble-shooting:
*Watch out for worn insulation and loose contacts.
*Eliminate open circuits/contact resistances.

Top view of control-unit plug



227 / 321

Attach plug to control unit and throttle-valve potentiometer.

Return to self-diagnosis test table C23

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (5)

SELF-DIAGNOSIS FLASHING CODE 2312

Test temperature sensor (engine):

Detach plug from temperature sensor.

Test resistance directly at temperature sensor:

Ambient temperature

+15°...30°C

Set value: 1.45...3.3 k Ω

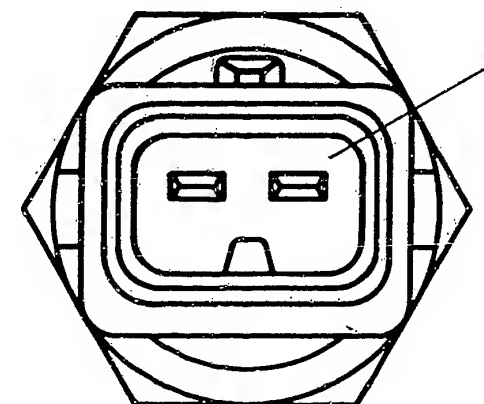
Engine at operating temperature approx. +80°C

Set value: 280...360 Ω

Is set value attained?

N>

Renew temperature sensor.



280 / 1346

Top view of connector of engine-temperature sensor

Detach control-unit plug.

Use ohmmeter to check following leads for continuity, set value approx. 0 Ω :

*From control-unit plug term. 2 to temperature sensor term. 5 to temperature sensor.

Is set value attained?

N>

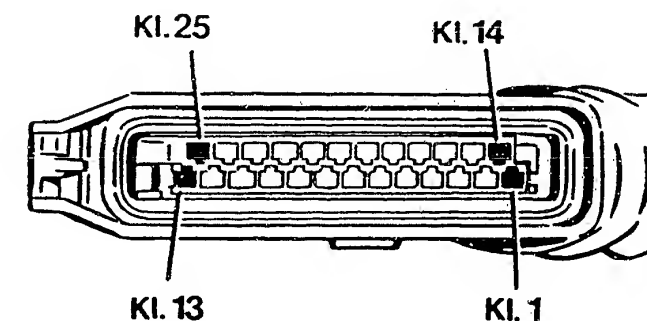
Trouble-shooting:

*Watch out for worn insulation and loose contacts.

*Eliminate open-circuits and contact resistances.

*Renew corroded spring contacts. Allow to engage when installing; it must not be possible to push them back.

Top view of control-unit plug



227 / 321

Connect plug to control unit and temperature sensor.

Return to self-diagnosis test table C23

D07

<=>

D08

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6)

SELF-DIAGNOSIS FLASHING CODE 2322

Check temperature sensor
(intake air).

Detach 4-pole plug from
hydraulic section.

Measure resistance directly
at temperature sensor between
term.1 and term.4:

Ambient temperature

+15°...30°C

Set value: 1.45...3.3 k Ω

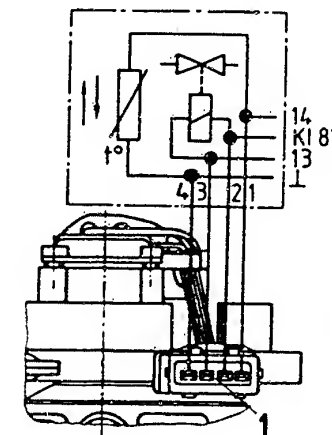
At approx. +50°C

Set value: 700...950 Ω

Is set value attained?

N>

*Trouble-shooting:
Renew temperature sensor
(intake air) if set value
is not attained.
Refer to Coordinate A17.



280 / 1394

1 = Multiple plug of solenoid-
operated injection valve
and temperature sensor
(intake air)

Detach control-unit
plug.
Use ohmmeter to check
following leads for
continuity,
set value approx. 0 Ω :

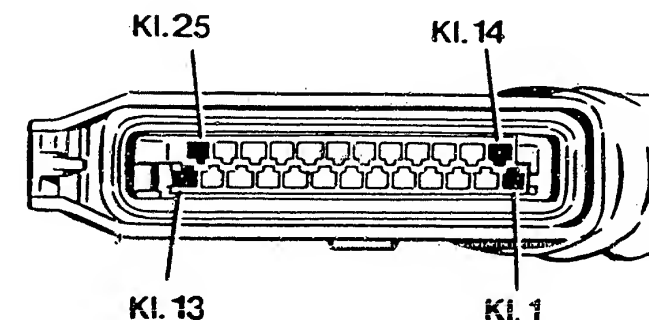
*From control-unit plug
to temperature sensor
term. 14 to term. 1
term. 5 to term. 4

Is set value attained?

N>

Trouble-shooting:
*Watch out for worn
insulation and loose contacts.
*Eliminate open-circuits and
contact resistances.
*Renew corroded spring
contacts. Allow to engage
when installing; it must
not be possible to push
them back.

Top view of control-unit plug



227 / 321

Connect plug to control
unit and temperature
sensor.

Return to self-diagnosis
test table C23

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7)

SELF-DIAGNOSIS FLASHING CODE 2341 2343

Lambda closed-loop control
outside working range (control
limit exceeded or undershot,
adaption limits reached).

Possible sources of trouble:

- *No or incorrect function of
lambda closed-loop control.
Open circuit in sensor lead
term.20 or short circuited
to ground or positive.
- *Fuel pressure/delivery of
electric fuel pump outside
tolerance,
set value: see brief instructions.

- *Leak in air intake system
or exhaust system.

- *Tank ventilation valve(s)
permanently open.

- *Defective injection valve
Resistance: 1.0...1.6 Ω .

- *Throttle-valve potentiometer not O.K.

- *Tank run empty.

Stated items O.K.?

N>

Troubleshooting:

- *Watch out for worn
insulation and loose contacts.
Eliminate open circuit or
short circuit in sensor lead
term.20.

- *Correct fuel pressure/delivery
of electric fuel pump.

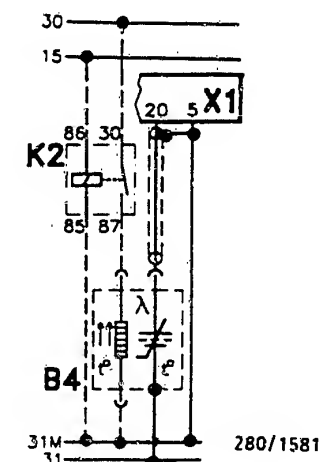
- *Eliminate leaks.

- *Repair tank ventilation
valve(s).

- *Renew defective injection
valve, see Coordinate A19.

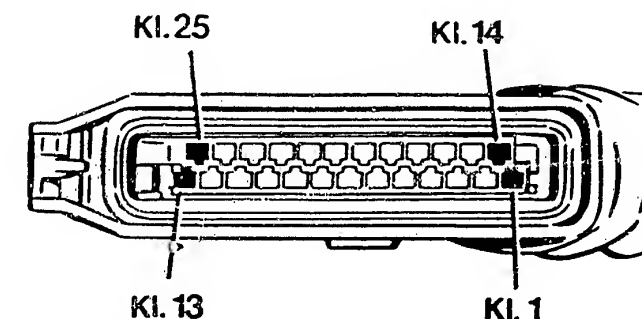
- *Replace defective potentiometer
by renewing throttle-valve
section, refer to
Coordinate A25.

- *If tank empty, fill up tank:



X1 = Control-unit plug
K2 = Sensor-heater relay
B4 = Lambda sensor with
heater

Top view of control-unit plug



227 / 321

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7) CONTINUED (1)

Check lambda closed-loop control
(control-unit functions)

Engine at operating temperature
Detach lambda-sensor plug.
Heating must be connected.

Measure sensor voltage with lambda
closed-loop control tester
ETT 018.10 (or digital multimeter)
between sensor lead (+)
and engine ground (-).
Run engine.

Lean mixture simulation:
Press grey button on tester
(or connect lead on control
unit end to ground).
Sensor voltage must increase.
Set value: 0.6...1.0 V

Rich mixture simulation:
Press black button on tester
(or apply 1.5...2.0 V to
lead on control unit end).
Sensor voltage must drop.
Set value: 0.05...0.3 V.

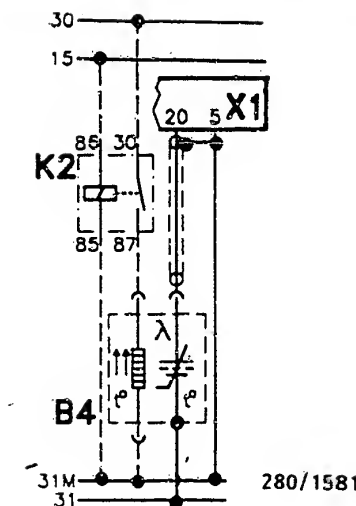
Is set value attained?

N>

Check following lead for
continuity with ohmmeter,
set value approx. 0 Ω :
From control-unit plug
term.20 to sensor plug.

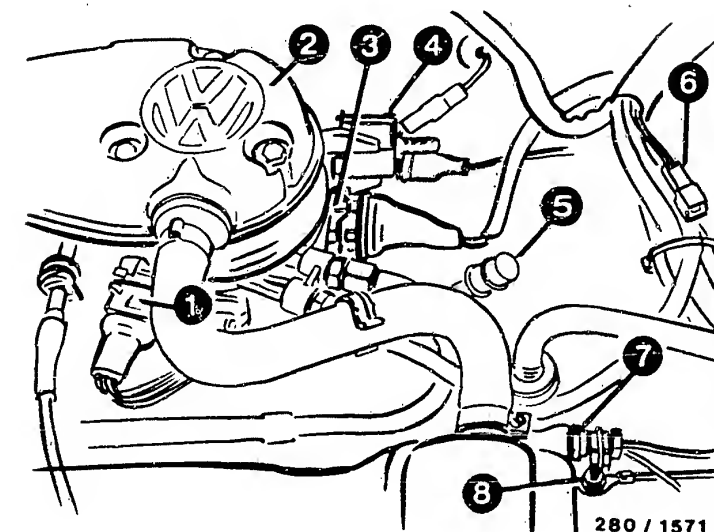
Check following lead for
insulation with ohmmeter,
set value greater than 1 M Ω
From control-unit plug term.20
to vehicle ground.

If set value is not obtained,
replace control unit.



X1 = Control-unit plug
K2 = Sensor-heater relay
B4 = Lambda sensor with
heater

1=Plug for injection valve/
temperature sensor
2=Air scoop
3=Throttle-valve potentiometer
4=Ignition timing valve
5=Emission sampling point
6=Diagnosis plug
7=Plug connection for lambda
sensor lead
8=Ground connection



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7) CONTINUED (2)

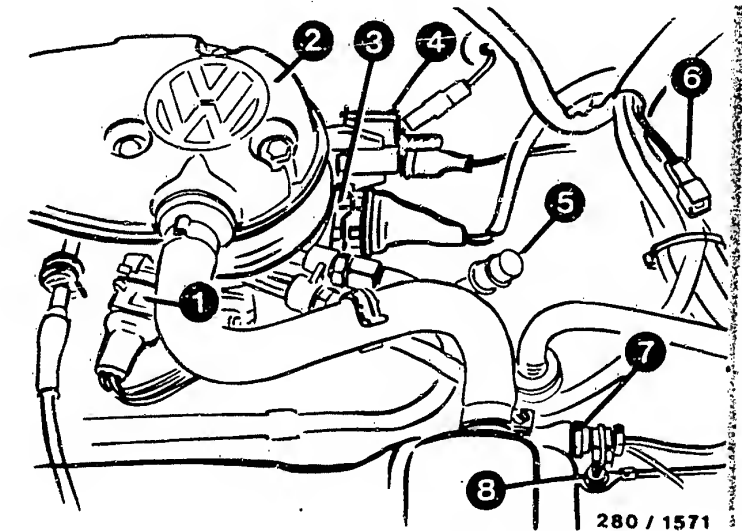
Renew lambda sensor.

Note: prior to installation,
coat sensor thread with assembly
paste VS 14016 Ft. Ensure
that no paste gets into slots
of conduit.

Assembly-paste part no.:
5 964 080 112.

Connect sensor plug.
Do not use contact spray.

Lambda closed-loop control
does not need to be adjusted,
since adaptive system used.



- 1=Plug for injection valve/
temperature sensor
- 2=Air scoop
- 3=Throttle-valve potentiometer
- 4=Ignition timing valve
- 5=Emission sampling point
- 6=Diagnosis plug
- 7=Plug connection for lambda
sensor lead
- 8=Ground connection

Return to self-diagnosis
test table C23

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8)

SELF-DIAGNOSIS FLASHING CODE 2342

Test lambda sensor

Disconnect plug connection of lambda sensor.

Use ohmmeter to check following leads for continuity.

Set value: approx. 0 Ω

From control-unit plug term.20 to plug connection.

From heater plug to relay, sensor heater term.87.

From heater plug to engine ground.

From sensor housing to engine ground.

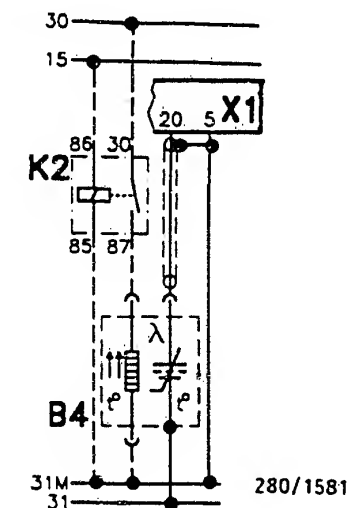
Use ohmmeter to check following lead for insulation,

set value greater than 1 M Ω

From control-unit plug term.20 to engine ground.

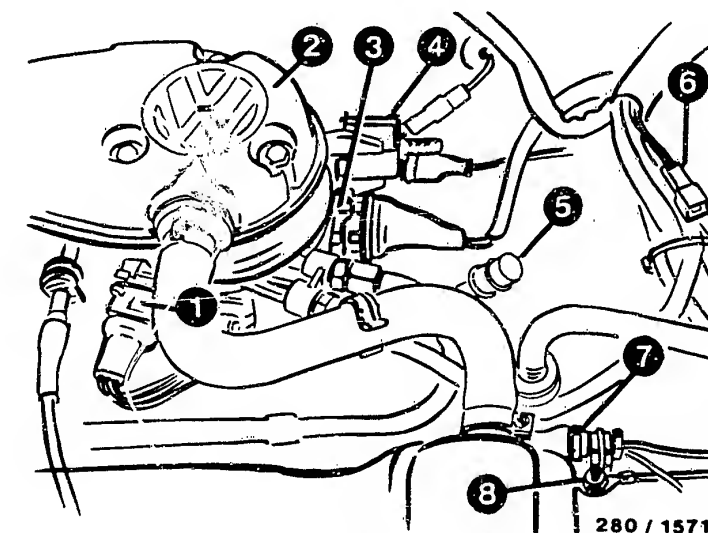
Is set value attained?

Repair defective lead or plug.
Pay attention to shielded sensor lead.



X1 = Control-unit plug
K2 = Sensor-heater relay
B4 = Lambda sensor with heater

1=Plug for injection valve/
temperature sensor
2=Air scoop
3=Throttle-valve potentiometer
4=Ignition timing valve
5=Emission sampling point
6=Diagnosis plug
7=Plug connection for lambda
sensor lead
8=Ground connection



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8) CONTINUED (1)

Renew lambda sensor.

Note: prior to installation,
apply assembly paste
VS 14016 Ft to thread of sensor.
Ensure that no paste gets into
slots of conduit.
Assembly-paste part no.:
5 964 080 112

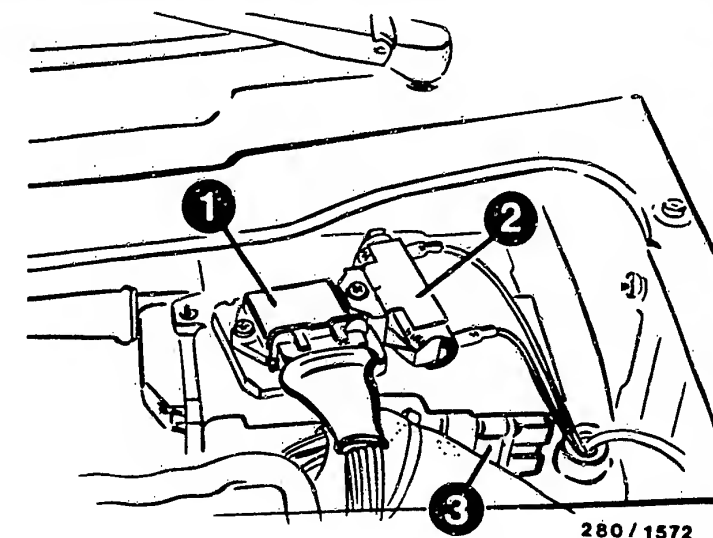
Connect sensor plug.
Do not use contact spray.

Lambda closed-loop control
need not be set since
adaptive system is used.

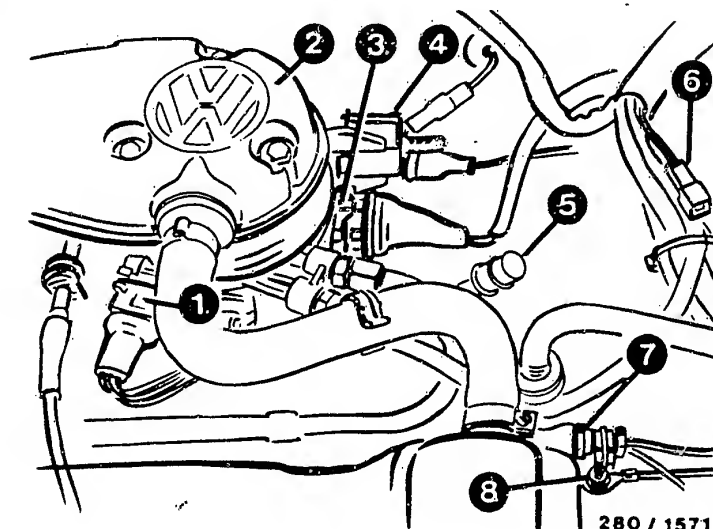
Has fault now been eliminated?

Renew control unit.

The control unit is on the left
in the plenum chamber beneath
a cover plate.



- 1 = TIH ignition trigger box
- 2 = Series resistor for injection valve
- 3 = Monojetronic control unit
- 1=Plug for injection valve/temperature sensor
- 2=Air scoop
- 3=Throttle-valve potentiometer
- 4=Ignition timing valve
- 5=Emission sampling point
- 6=Diagnosis plug
- 7=Plug connection for lambda sensor lead
- 8=Ground connection



Return to self-diagnosis
test table C23

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9)

SELF-DIAGNOSIS FLASHING CODE 4431

Test throttle-valve actuator:

Detach 4-pole plug from actuator.

Measure resistance directly at actuator between term.1 and term.2.

Set value: 4...250 Ω

Is set value attained?

N>

*Trouble-shooting:
Renew throttle-valve actuator if set value not attained.
Refer to Coordinate A21.

Y
V

Detach control-unit plug.

Use ohmmeter to check following leads for continuity, set value approx. 0 Ω :

*From throttle-valve actuator term.1 to control-unit plug term.24.

*From throttle-valve actuator term.2 to control-unit plug term.23.

Is set value attained?

N>

Trouble-shooting:
*Watch out for worn insulation and loose contacts.
*Eliminate open circuits/contact resistances.

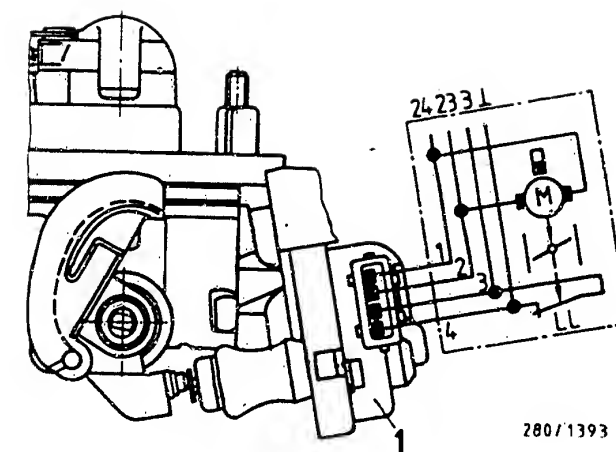
Y
V

Attach plug to control unit and throttle-valve actuator.

Y

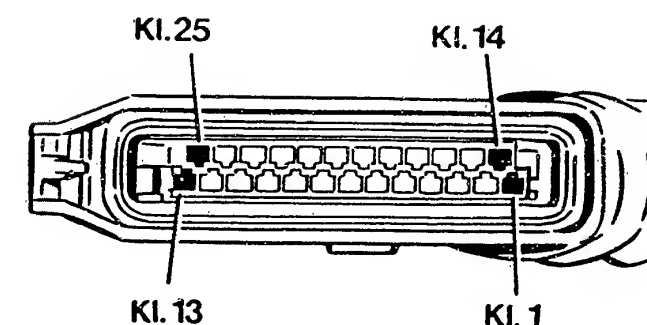
V

Return to self-diagnosis test table C23



1 = Throttle-valve actuator

Top view of control-unit plug



227 / 321

TROUBLE-SHOOTING PROGRAM (1)

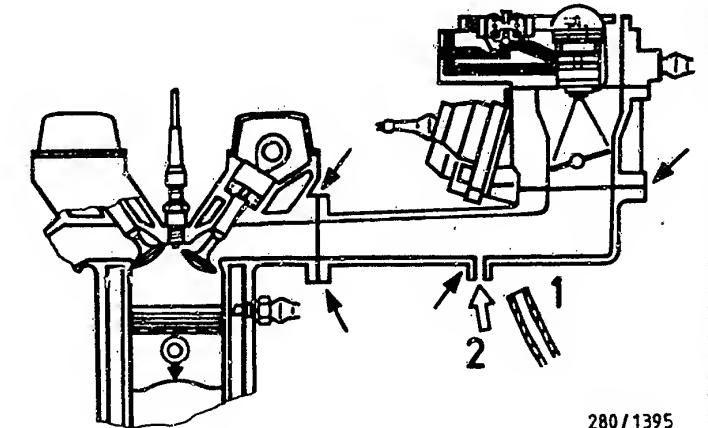
Check air-intake system

Are all hoses correctly connected, not kinked or damaged?
Is oil dipstick pressed all the way in? Is lid seal on oil filler neck O.K.?

Are all hoses O.K.?

Replace hoses if necessary.
Re-tighten hose binders.

Push in oil dipstick firmly.
Replace lid seal on oil filler neck.



280/1395

1 = Seal off
2 = Blow in air
Small arrows = Possible leakage points

Leakage test

Seal off exhaust tail pipe.

Detach hose from intake manifold and throttle-valve section and seal off.

Using a compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Spray or brush all joints with leak-detector spray or soapy water.

Are all joints leak-tight?

Bubbles or foaming indicate leaks.

Eliminate leaks by means of new seals or by tightening tie bands.

Leaks can also occur at the following points:
Throttle-valve mount,
intake-manifold seal and
auxiliary units
(e.g. tank ventilation system,
brake booster) which
make use of the intake
manifold pressure.

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (2)

Check fuel delivery.

Measure fuel delivery of electric fuel pump against pressure. Therefore, measuring point at return, after pressure regulator.

Disconnect fuel-return hose from throttle-body injection unit.

Attach test hose to return and lead into a 1.5 l measuring glass.

Detach pump relay.

Insert jumper into connection base (pump relay) between term.87 and term. 30.

(See lower illustration)

Measuring time 30 sec.

Fuel delivery at 12 V voltage

SET VALUE: see brief instructions

Set value obtained?

Following completion of test:

Remove jumper and insert pump relay into connecting frame.

Detach test hose and attach fuel return hose to return connection.

Pay attention to leaks.

Return to trouble-shooting chart B03

*Fuel filter very dirty, replace.

*Fuel delivery line clogged, replace.

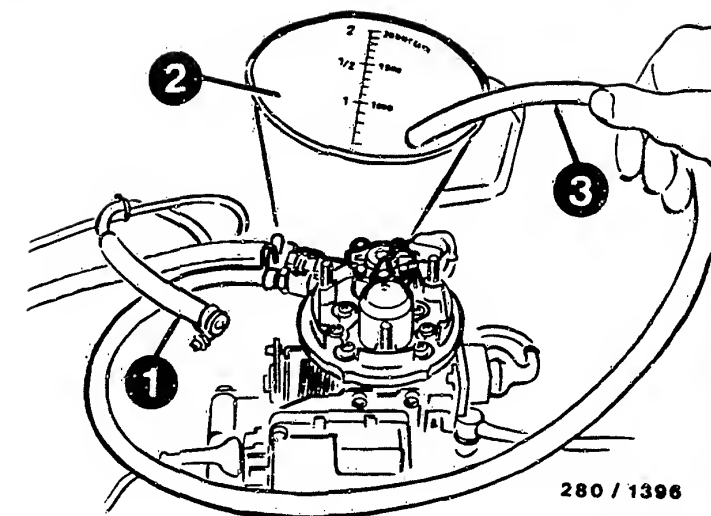
*Voltage at electric fuel pump with engine running min. 12 V. If not, clean contacts, eliminate poor ground connection, replace leads.

*If fuel-pump delivery too low and fuel pressure O.K., replace electric fuel pump. Clean joints before loosening so that no dirt gets into the fuel system. In-tank electric fuel pumps are accessible via a closure on the tank.

*If electric fuel pump is loud (vapor locks) or intake line constricted, replace defective connections. Strainer in tank clogged, replace.

Corrosion in tank, clean or replace.

*Pressure regulator defective, check fuel pressure.



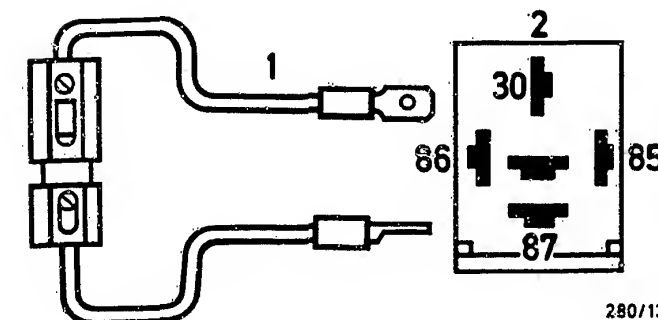
1 = Fuel return hose

2 = Measuring glass

3 = Test hose

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection base



TROUBLE-SHOOTING PROGRAM (3)

Test fuel pressure with engine stopped.

Measure pressure upstream of pressure regulator. Measurement point at inlet of throttle-body injection unit, at hose connection or at fuel filter.

Detach fuel inlet hose.

CAUTION!

Catch fuel as it flows out. It must not make contact with hot engine parts.

Connect pressure gauge KDJE-P100/17 (1.6 bar) with hose.

To do so, use connection part KDJE-P100/14 (M14x1.5).

Pay attention to tight connection. Insert jumper between term.87 and term.30 in connection frame (pump relay).

Electric fuel pump runs.

Fuel pressure

SET VALUE: see brief instructions

Is set value attained?

N>

SET VALUE UNDERSHOT:

*S l o w l y pinch off fuel return hose.

Caution! Do not allow

pressure to exceed 1.6 bar.

If pressure exceeds 1.5 bar,

pressure regulator is

defective; renew hydraulic section of throttle-body injection unit.

Refer to Coordinate A25

If pressure does not exceed

2.5 bar, check fuel

delivery.

Refer to Coordinate D25

*Renew fuel filter if heavily clogged.

*Renew fuel-injection tubing or pressure damper (where applicable) if clogged.

*Filter in tank clogged.

Corrosion in tank.

SET VALUE EXCEEDED:

Detach fuel return hose from throttle-body injection unit.

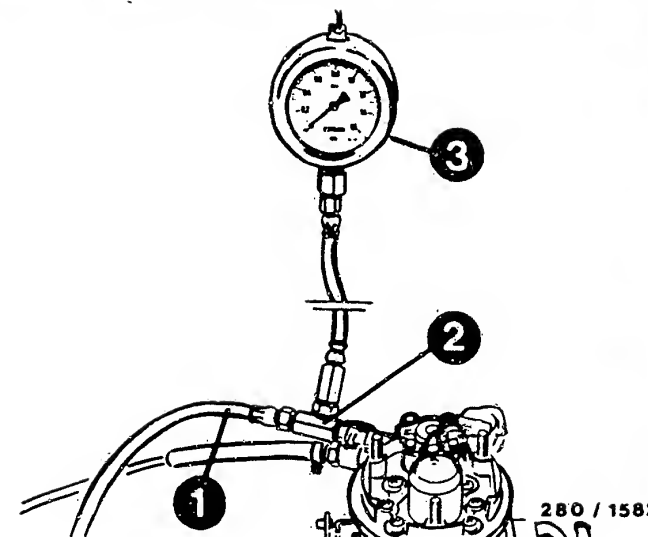
Attach test hose to fuel return and route into 1.5 l measuring jug.

Is set value now attained?

*If yes, fuel return clogged or squashed - renew.

*If not, pressure regulator defective, renew hydraulic section of throttle-body injection unit.

Refer to Coordinate A25



1 = Fuel inlet hose

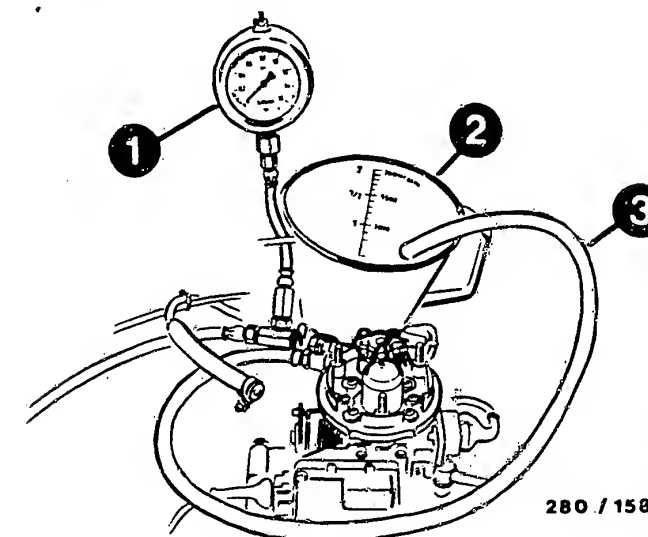
2 = Connection part KDJE-P100/14

3 = Pressure gauge KDJE-P100/17

1 = Pressure gauge

2 = Measuring glass

3 = Test hose



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (3) CONTINUED (1)

Check fuel system externally for leaks.

Insert jumper into connection base (pump relay) between term.87 and term.30.
Electric fuel pump running.

There must be no escape of fuel to the outside (visual check).

Set value obtained?

N>

*Joints between components, fuel hoses and lines leaking, tighten hose band clips, or replace hose.

*Pressure regulator leaking at diaphragm, replace hydraulic section of throttle-body injection unit.
Refer to Coordinate A25

*Injection valve leaking at upper or lower O-ring, replace O-rings.
Refer to Coordinate A19

*Pressure damper or fuel filter leaking, replace.

Replace injection valve.
Refer to Coordinate A19

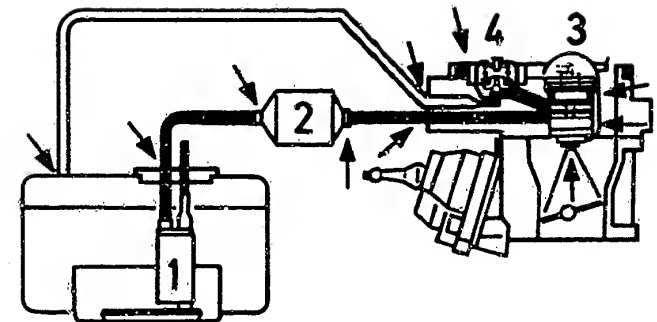
Check injection valve for leaks:

Insert jumper between term.87 and term.30 in connection frame (pump relay).
Electric fuel pump runs.

Set value:
A maximum of one droplet may drip off injection valve within 60 s.
(Visual inspection with hand lamp and small mirror).

Is set value attained?

N>

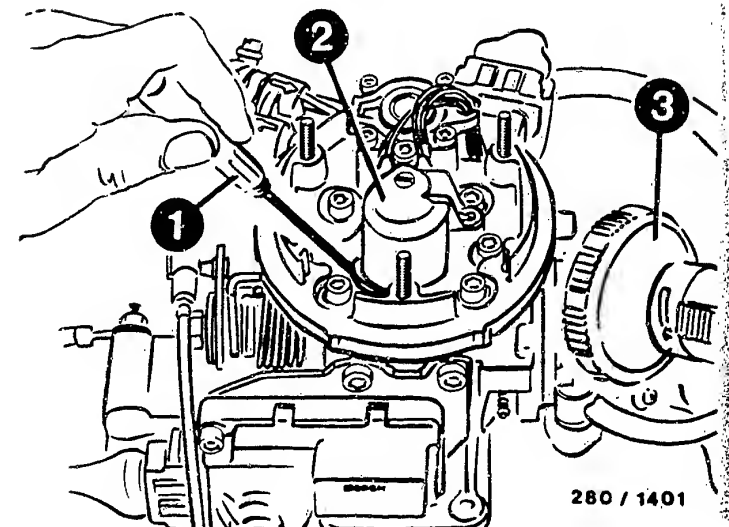


280 / 1399

- 1 = Electric fuel pump
- 2 = Fuel filter
- 3 = Injection valve
- 4 = Pressure regulator

Arrows = possible leakage points

- 1 = Inspection mirror
- 2 = Injection valve
- 3 = Hand lamp



280 / 1401

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (3) CONTINUED (2)

Check fuel system for internal leakage.

Pressure gauge at inlet and test hose at return remain connected.

Insert jumper between term.87 and term.30 in connection frame (pump relay).
Electric fuel pump runs.

Remove jumper.

Set value:
Fuel pressure remains virtually constant.

Is set value attained?

N>

Pinch off test hose.

Insert jumper only very briefly.

Caution:

Do not allow fuel pressure to increase above approx. 1.5 bar.

Set value:

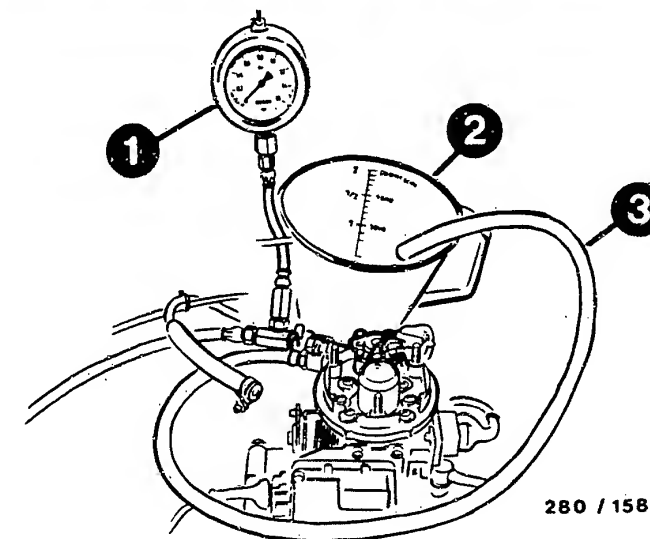
Fuel pressure remains virtually constant.

If set value is not obtained, non-return valve of electric fuel pump is leaking.

If non-return valve is screw-in type, replace.

If non-return valve is fixed, replace electric fuel pump.

Pressure regulator is leaking if set value attained, renew hydraulic section.
See Coordinate A25



280 / 1583

- 1 = Pressure gauge
- 2 = Measuring glass
- 3 = Test hose

After testing is finished:

Insert pump relay in connection base.

Dismantle pressure gauge and test hose.

Mount fuel-inlet and fuel-return hoses on tail pieces of throttle-body injection unit.

Make sure there are no leaks.

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (4)

Check solenoid-operated injection valve with engine running

N>

Connect motortester as for ignition-point measurement.

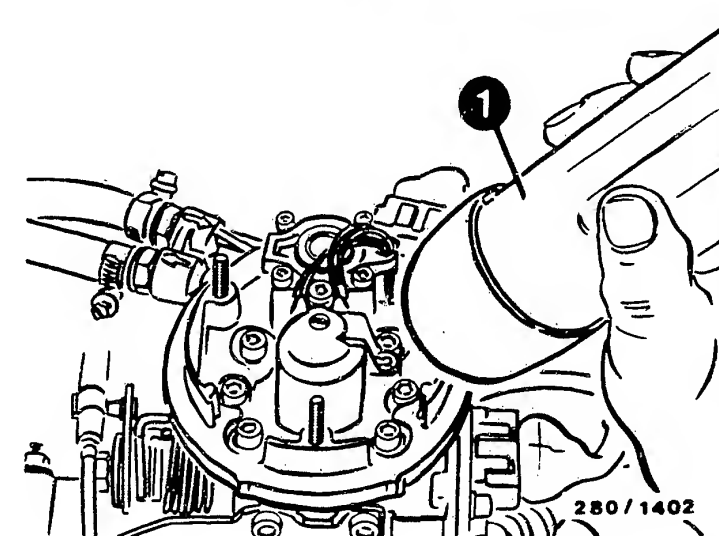
Let engine run.

Flash throttle-valve with timing light. Turn adjusting wheel until injection cone is visible.

Set value: injection cone should have good spray formation and atomization in entire range.

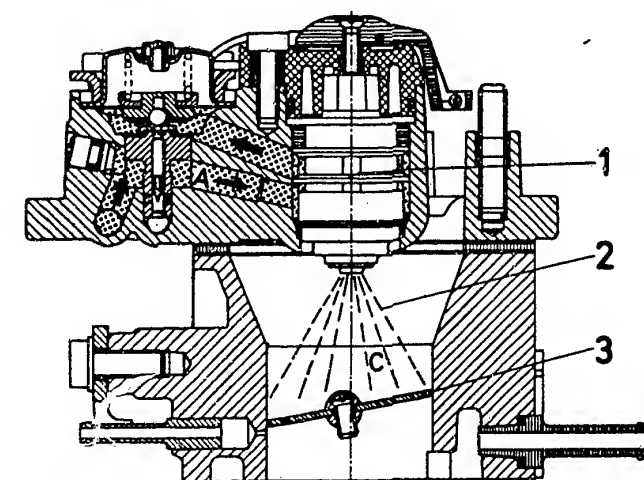
Set value obtained?

Replace injection valve. Refer to Coordinate A19



1 = Timing light

1 = Solenoid-operated injection valve
2 = Injection cone
3 = Throttle valve



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (5)

Check interference and misfiring.

N>

Check connections and/or pay attention to good contact.

Connect engine tester (special input) to solenoid-operated injection valve.

Black clip to engine ground.

Push back rubber sleeve at connected multiple plug.

Connect red clip by means of test lead KDZS 0004 to test connection term.2 or term.3 (top picture).

Run engine.

Given correct connection, injection pulses (bottom picture) are visible on the oscilloscope.

Set value: injection pulses

Is set value attained?

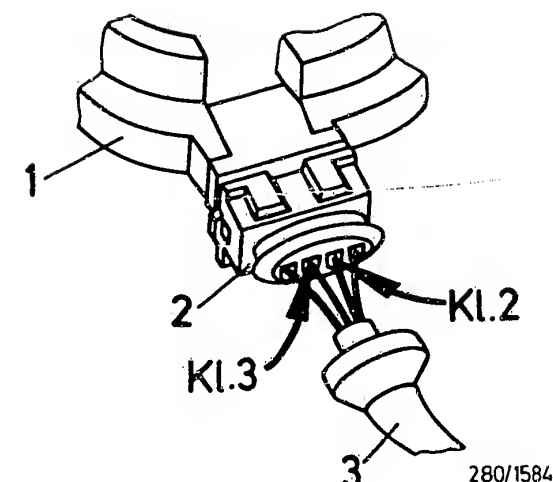
Detach test lead(s) KDZS 0004 and push on rubber sleeve on multiple plug. Disconnect motortester.

Return to trouble-shooting chart B03

In the event of interference, check the cable installation, i. e. route ignition leads separately from the wiring harness.

Other disturbances may be caused by the generator, radio or interference suppressor boxes for example.

In the event of misfiring, check all electrical plug connections, particularly positive supply, ground connection and ignition signal term.1.



1 = Hydraulic section

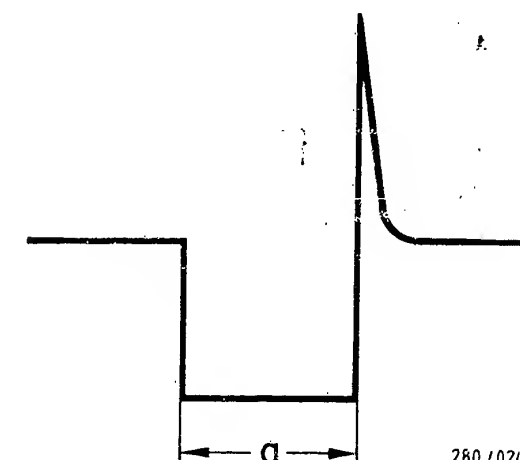
2 = Multiple plug

3 = Rubber sleeve

Term.2, term.3 = Test connection

Injection pulses of a switched output stage (measured at the injection valve)

a = Pulse length (dependent on engine load)



TROUBLE-SHOOTING PROGRAM (6)

Test start control.

Detach ignition cable term.4 from ignition distributor cap and connect tightly to vehicle ground with sleeve-type suppressor. Engine must not start.

Caution:

Interference-suppression resistor must have min. 2 k Ω resistance, (e.g. sleeve-type suppressor 5 k Ω) 0 356 500 001.

Push back rubber sleeve at connected multiple plug. Connect analog multimeter with measurement leads KDZS 004 (bottom picture). Measuring range approx. 10 V.

Detach connector from temperature sensor (engine) and hook up 10 k Ω resistor, e.g. temperature sensor 0 280 130 028 (at 15...30°C) 10 k Ω .

Start engine.

Set value: voltage drops from initially greater than 1.0 V within approx. 15 s starting time to approx. 0.3 V. Start repetition time longer than 1 minute.

Is set value attained?

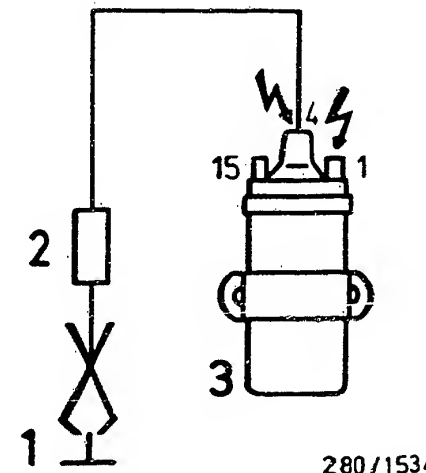
N>

Detach control-unit plug.

Use ohmmeter to check following leads for continuity, set value approx. 0 Ω :

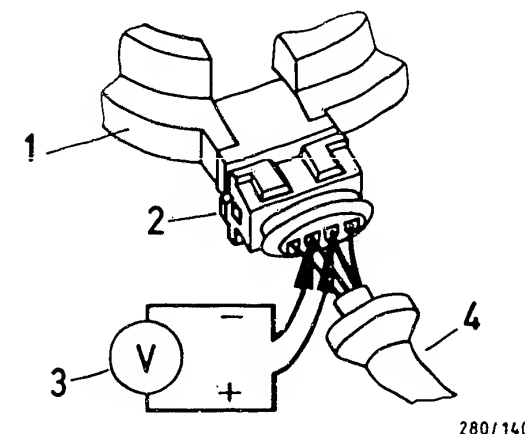
*From control-unit plug term. 2 to temperature sensor term. 5 to temperature sensor.

Renew control unit if leads are O.K.



- 1 = Ground terminal
- 2 = Sleeve-type suppressor 5 k Ω 0 356 500 001
- 3 = Ignition coil
- Caution! term. 1 and term. 4: hazardous voltages 400 V - 25 kV.

- 1 = Hydraulic section
- 2 = Multiple plug
- 3 = Measurement arrangement
- 4 = Rubber sleeve



Detach sleeve-type suppressor, multimeter and 10 k Ω resistor. Attach connector to temperature sensor.

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (7)

Test overrun cutoff.

Connect engine tester
(special input) to
injection valve.
Black clip to engine
ground.
Push back rubber sleeve at
attached multiple plug.

Connect red clip by means of
test lead KDZS 0004 to test
connection term.2 or term.3
(top picture).

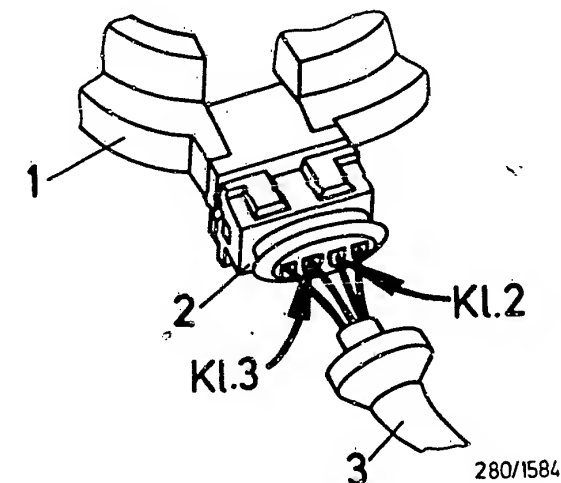
Run engine.

Given proper connection,
injection pulses (bottom
picture) are visible on the
oscilloscope.

Set value: injection pulses

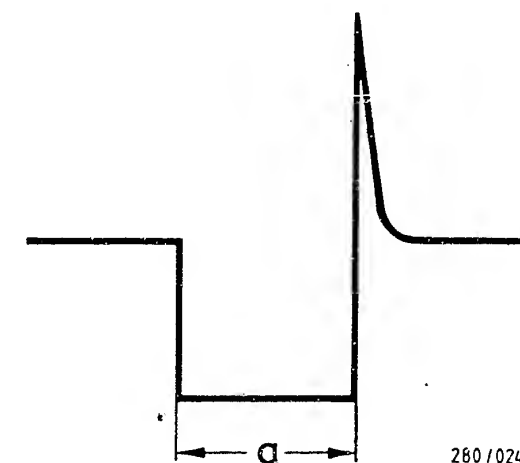
Is set value attained?

Check connections and/or
pay attention to good contact.



1 = Hydraulic section
2 = Multiple plug
3 = Rubber sleeve
Term.2, term.3 = Test connection

Injection pulses of a switched
output stage (measured at the
injection valve)
a = Pulse length (dependent
on engine load)



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (1)

Slowly increase engine speed to approx. 3000 min⁻¹. Injection pulses must be visible on oscilloscope. Take foot off accelerator pedal (idle position). Injection pulses no longer present.

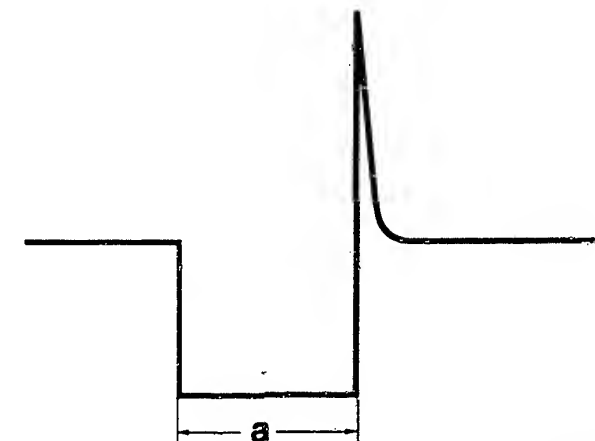
Set value:
With decreasing engine speed, injection pulses cut in again above idle speed.

Is set value attained?

N>

Make sure that idle contact is functional and that lead to control unit term.3 and engine ground has continuity.

Renew control unit if idle contact and leads are O.K.



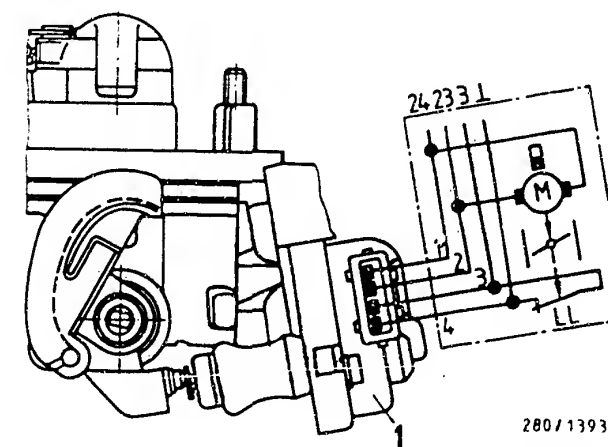
280/0249

Injection pulses of a switched output stage (measured at the injection valve)
a = Pulse length (dependent on engine load)

1 = Throttle-valve actuator

Detach test lead(s) KDZS 0004 and push on rubber sleeve on multiple plug. Disconnect motortester.

Return to trouble-shooting chart B03



280/1393

E13

==>

E14

<==

TROUBLE-SHOOTING PROGRAM (8)

Check idle speed

Requirement:

*Air-intake system is leak-tight.

*Air filter not clogged.

*Throttle-plate lever is in contact with stop plate of idle switch.

*Accelerator cable or linkage is adjusted to be free of tension.

*Ignition and valve gear in working order.

* Engine at operating temp., approx. + 80° C

* Switch off air conditioner (if fitted).

Set value: see brief instructions

Is set value obtained?

N>

Ensure that idle contact is functional and that lead to control unit term.3 and to engine ground has continuity.

Check function of throttle-valve actuator if idle contact and leads are O.K.

Detach connector from temperature sensor (engine) and hook up 10k Ω resistor, e.g. temperature sensor 0 280 130 028 (at +15...+30°C) 10k Ω . Ignition "ON"

Throttle-valve actuator must deflect throttle valve. If not, renew control unit.

Reconnect connector to temperature sensor (engine).

Note:

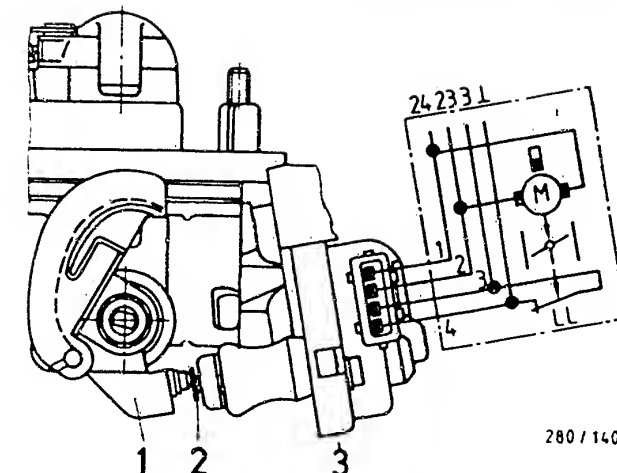
The assignment screw is not used to set the idle speed, but rather to assign the throttle-plate lever to the actuator. The idle speed is regulated adaptively.

Check CO concentration.

As a result of the adaptive lambda closed-loop control CO adjustment is not necessary.

In the event of idling problems, see next micropicture.

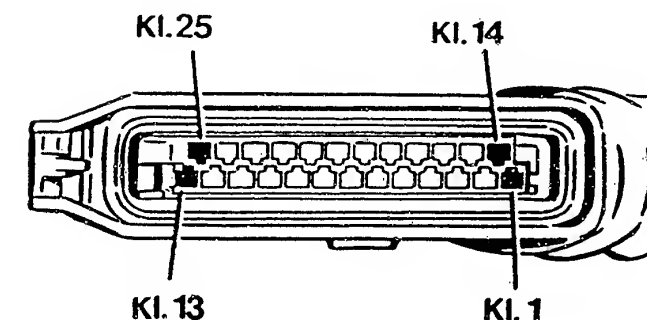
Return to trouble-shooting chart B03



280 / 1406

- 1 = Throttle-plate lever with assignment screw
- 2 = Stop plate of idle switch
- 3 = Throttle-valve actuator with idle contact

Top view of control-unit plug



227 / 321

TROUBLE-SHOOTING PROGRAM (9)

Test lambda sensor

Engine at operating temperature, lambda sensor must be properly heated up. Idle speed O.K.

Disconnect lambda sensor plug to check sensor signal. Heating must be connected.

Measure sensor voltage with lambda closed-loop control tester ETT 018.10 (or multimeter) between sensor lead (+) and engine ground (-).

Run engine. Sensor voltage must increase on accelerating.

Set value: 0.6...1.0 V

Is set value attained?

N>

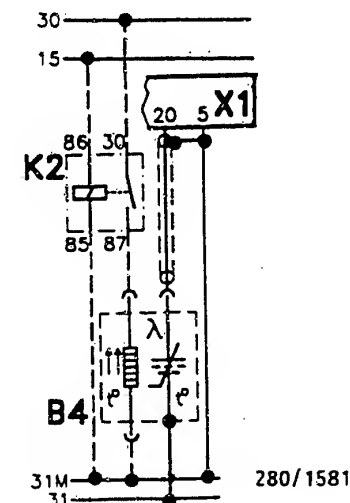
Use ohmmeter to check following lead for continuity. Set value: approx. 0 Ω

From control-unit plug term.20 to plug connection.
From heater plug to relay, sensor heater term.87.
From heater plug to engine ground.
From sensor housing to engine ground.

Use ohmmeter to check following lead for insulation, set value greater than 1 M Ω
From control-unit plug term.20 to engine ground.

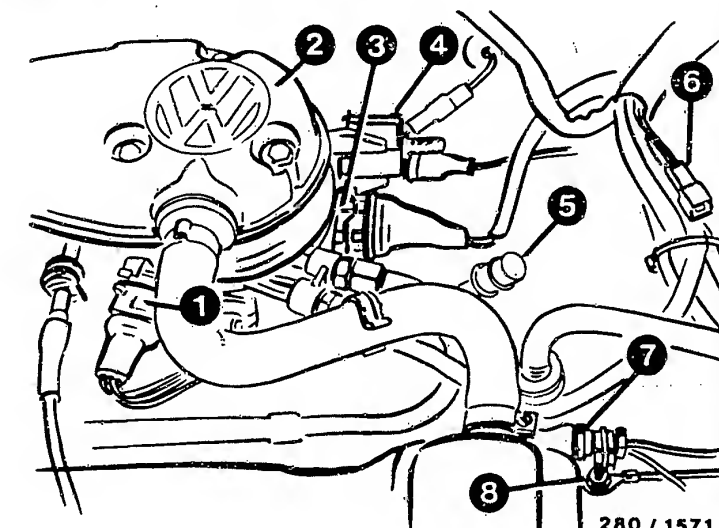
Renew lambda sensor if leads are O.K.
On assembly, only coat thread with assembly paste 5 964 080 112.

Do not use contact spray on sensor plug.



X1 = Control-unit plug
K2 = Sensor-heater relay
B4 = Lambda sensor with heater

1=Plug for injection valve/temperature sensor
2=Air scoop
3=Throttle-valve potentiometer
4=Ignition timing valve
5=Emission sampling point
6=Diagnosis plug
7=Plug connection for lambda sensor lead
8=Ground connection



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (9) CONTINUED (1)

Check lambda closed-loop control
(control-unit functions)

N>

Engine at operating temperature
Detach lambda-sensor plug.
Heating must be connected.

Measure sensor voltage with lambda
closed-loop control tester
ETT 018.10 (or digital multimeter)
between sensor lead (+)
and engine ground (-).
Run engine.

Lean mixture simulation:
Press gray button on tester
(or connect lead on control
unit end to ground).
Sensor voltage must increase.
Set value: 0.6...1.0 V

Rich mixture simulation:
Press black button on tester
(or apply 1.5...2.0 V to
lead on control unit end).
Sensor voltage must drop.
Set value: 0.05...0.3 V.

Is set value attained?

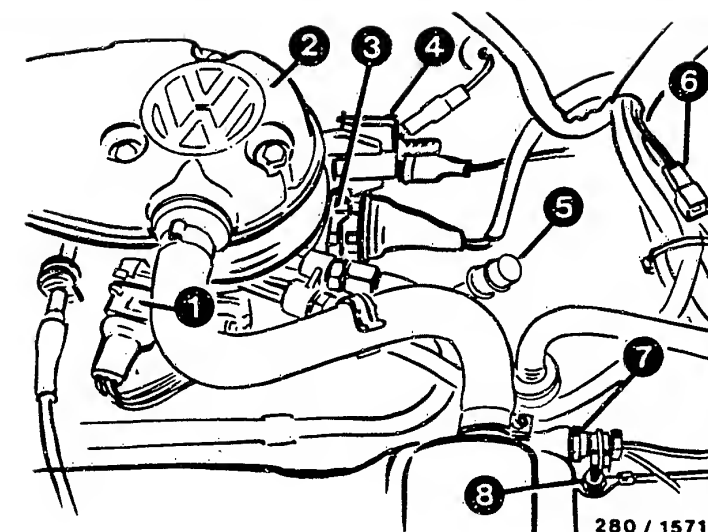
Disconnect lambda closed-loop
control tester (or digital
multimeter) and connect sensor plug.
Lambda closed-loop control
need not be set, since
adaptive system used.
Perform test drive.

Return to trouble-shooting chart
B03

Check following lead for
continuity with ohmmeter,
set value approx. 0 Ω ;
From control-unit plug
term.20 to sensor plug.

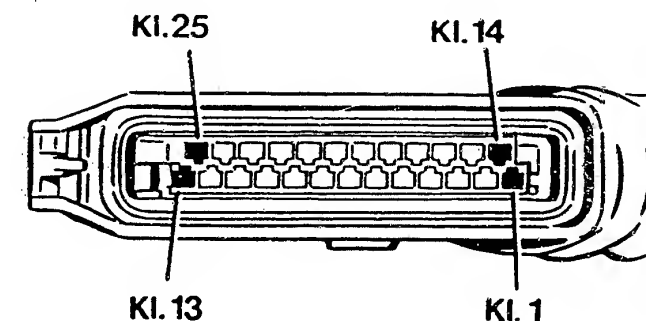
Check following lead for
insulation with ohmmeter,
set value greater than 1 M Ω
From control-unit plug term.20
to vehicle ground.

If set value is not obtained,
replace control unit.



- 1=Plug for injection valve/
temperature sensor
- 2=Air scoop
- 3=Throttle-valve potentiometer
- 4=Ignition timing valve
- 5=Emission sampling point
- 6=Diagnosis plug
- 7=Plug connection for lambda
sensor lead
- 8=Ground connection

Top view of control-unit plug



227 / 321

TROUBLE-SHOOTING PROGRAM (10)

Y

Check exhaust-gas cat. converter.

Engine at operating temperature.

Separate lambda-sensor plug (control) and measure CO concentration downstream of cat. converter. Make a note of the value.

Unscrew lambda sensor and measure CO concentration upstream of cat. converter in sensor hole. Use own-fabrication adapter for exhaust-gas sampling (thread M 18 x 1.5). Make a note of the value.

Set value: CO concentration downstream of catalytic converter must be considerably lower.

Set value obtained?

N>

If both values are almost the same, the catalytic converter is clogged (leaded fuel has been used) and must be replaced.

Y

Return to trouble-shooting chart B03

Y

TROUBLE-SHOOTING PROGRAM (11)

Check tank-ventilation system.

Check visually whether hoses of tank-ventilation system are correctly attached, not bent or damaged.
Check whether hose connections at intake manifold, tank bleeder valve, active-carbon canister and fuel tank are leak-tight.

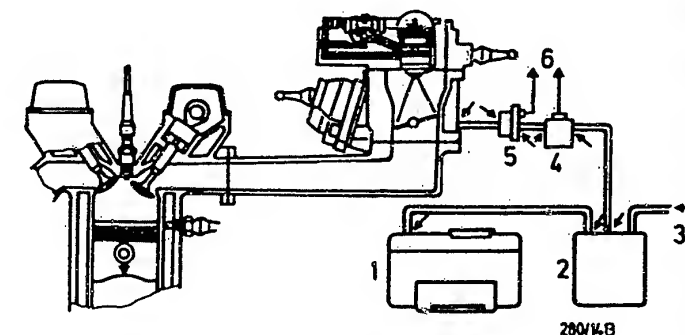
Are all hoses and connections O.K.?

N>

Replace defective hoses as necessary.
Eliminate leakages by tightening hose clamps.

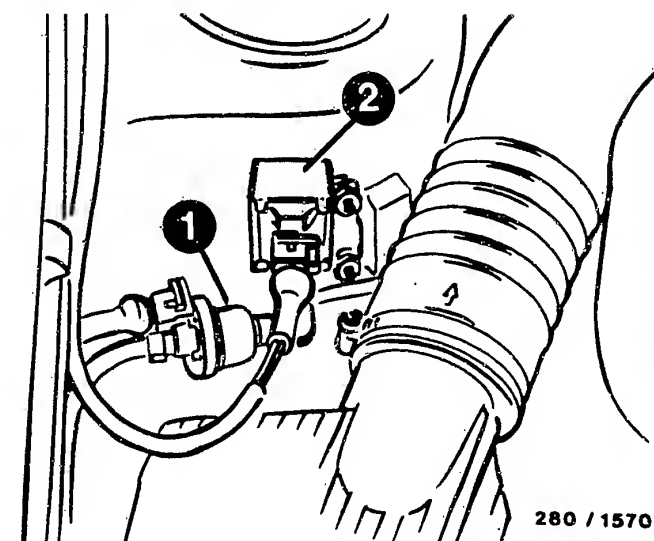
Continued on next picture page

E23



- 1 = Fuel tank
- 2 = Active-carbon container
- 3 = Air supply
- 4 = Tank-ventilation switching valve
- 5 = Frequency valve
- 6 = Electrical connections
- Arrows = Possible leak points

- 1 = Tank-ventilation frequency valve
- 2 = Tank-ventilation switching valve



E24



TROUBLE-SHOOTING PROGRAM (11) CONTINUED (1)

Tank-ventilation frequency valve, functional test

N>

Test actuation signal for frequency valve with oscilloscope. To do so, connect up 2-pole test lead 1 684 463 093 between frequency valve and its connector.

Connect engine tester (special input) to test lead: Connect red clip to one of the test-lead connections, black clip to engine ground.

Caution! Free test-lead connection must not come into contact with ground.

Start engine at operating temperature, part-load operation.

Given correct connection, oscilloscope must indicate pulses in accordance with adjacent diagram (top). The on/off ratio is a function of engine speed and load.

Set value: pulses

Pulses present?

Shut off engine and detach plug from control unit and frequency valve.

*Use ohmmeter to check lead from control unit term.12 to plug, frequency valve term.1 for continuity. Set value: 0 Ω

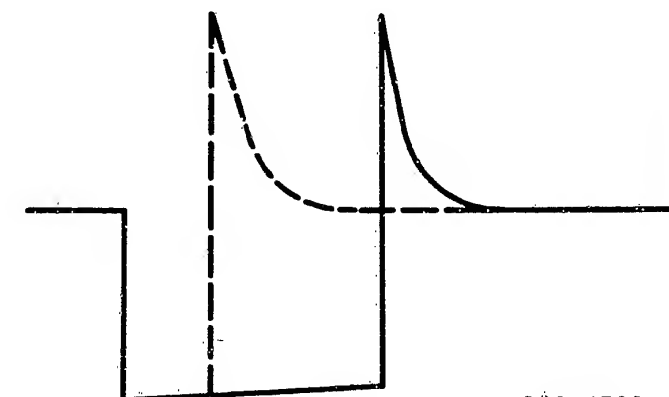
Eliminate any open circuit.

*Switch on ignition and use voltmeter to check voltage supply at plug of frequency valve term.2 with respect to engine ground.

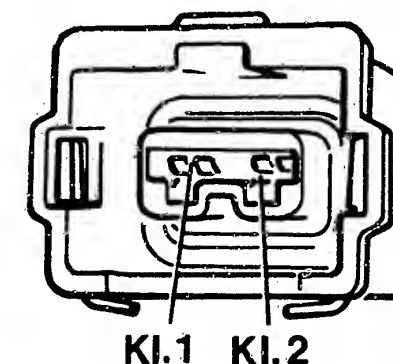
Set value: battery voltage.

Eliminate any open circuit in voltage supply from ignition/starting switch to frequency valve.

If no fault in lead, control unit is defective and should be renewed.



280/1509



261/761

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (11) CONTINUED (2)

Switch off engine and detach connector at tank-ventilation frequency valve.

Use ohmmeter to directly measure internal resistance of valves at both contacts.

Set value: see brief instructions

Is set value attained?

Internal resistance not within tolerance: renew tank-ventilation frequency valve.

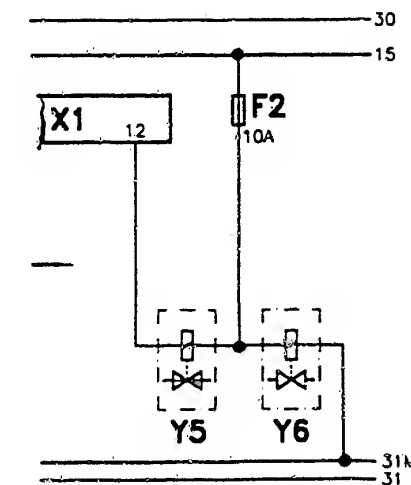
Check mechanical switching function of tank-ventilation frequency valve:

Connect term.1 of connector with test lead KDZS 0004 to positive terminal of battery.
Connect further test lead KDZS 0004 to second contact of valve.

Briefly connect test lead several times to engine ground. The valve must be heard and felt to switch.

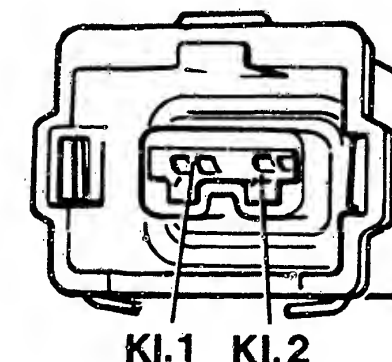
Does the valve switch ?

Renew sticking tank-ventilation frequency valve or valve which does not move freely.



280/1585

F2 = Fuse
X1 = Control-unit plug
Y5 = Tank-ventilation frequency valve
Y6 = Tank-ventilation switching valve



261/761

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (11) CONTINUED (3)

Tank-ventilation switching valve, functional test.

Use voltmeter to test voltage supply at plug of switching valve with respect to engine ground.
Switch on ignition.

Set value: battery voltage.

Is set value attained ?

N>

Eliminate open circuit in voltage supply from ignition/starting switch or engine ground to switching valve.

Check mechanical switching function of tank-ventilation switching valve:

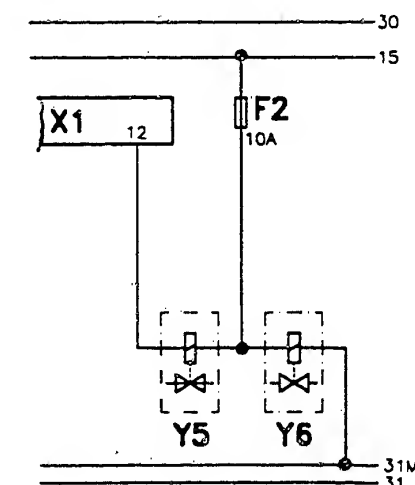
Switch on ignition.
Detach plug from switching valve and reconnect.
The valve must be heard and felt to switch.

Does the valve switch ?

N>

Renew sticking tank-ventilation switching valve or valve which does not move freely.

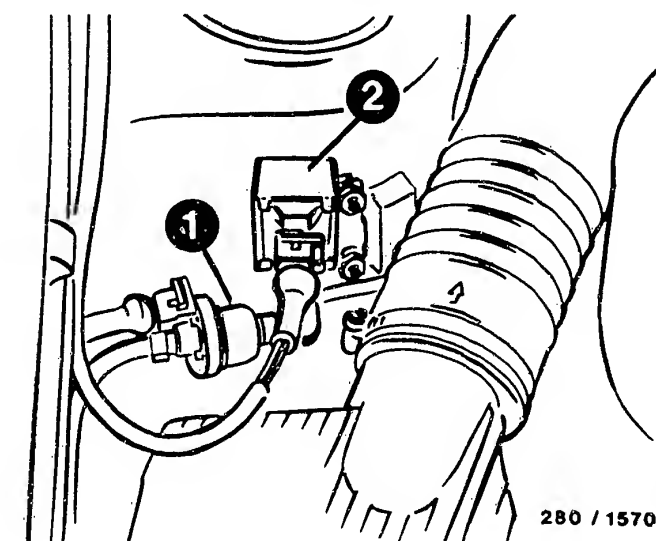
Return to trouble-shooting chart B03



280/1585

F2 = Fuse
X1 = Control-unit plug
Y5 = Tank-ventilation frequency valve
Y6 = Tank-ventilation switching valve

1 = Tank-ventilation frequency valve
2 = Tank-ventilation switching valve



280 / 1570

INDEX

Term	Coordinate
A/C compressor	B17
A/C readiness	B15
Activation of self-diagnosis	C21
Adapter lead	A10
Air intake system	D23
Assignment screw at throttle-plate lever	A21
CO content	E15/E21
Check list for universal test adapter	B05
Check valve	E03
Control unit	C27/E19
Diagnosis display	B23/C21
Diagram of air lines	A27
Diagram of fuel lines	A27
Electric fuel pump	B11
Exhaust-gas catalytic converter	E21
Flashing code	C21
Fuel delivery	D25
Fuel filter	D25/D27
Fuel pressure	D27
Fuel system leakage	E01
Ground connection	C09
How to use universal test adapter	B04
How to use microcard	A02
How to use self-diagnosis, self-diagnosis test table and trouble-shooting program	C19
How to use trouble-shooting chart	B01
How to use trouble-shooting program	B02
Hydraulic section	A25
Idle contact	B25/D01
Idle speed	E15

Index, continued

Term	Coordinate
Ignition signal	B05/D03
Ignition timing valve	B21
Injection pulse	E07/E11
Installation position of components	A13
Hydraulic section	A25
Solenoid-operated injection valve	A19
Temperature sensor (intake air)	A17
Throttle-body injection unit	A25
Throttle-valve actuator	A21
Interference	E07
Interference suppression	E07
Lambda closed-loop control	D11/E19
Lambda sensor	D17/E17
Leak test	E01
Misfiring	E07
Overrun cutoff	E11
Plausibility	A04
Precautionary measures	A07
Pressure regulator	D27/E01
Pump encoding	C03
Pump relay	B13
Removal and installation:	
Safety measures	A07
Self-diagnosis test table	C23
Self-diagnosis trouble-shooting program	C27
Sensor heater, sensor signal	E17
Series resistor for injection valve	C11
Solenoid-operated injection valve	C11/E05
Special features	A03
Start control	E09
Structure of this microcard	A01
TD engine-speed signal	B05/D03
Tank ventilation system	E23
Tank-ventilation frequency valve	B19/E25

Index, continued

Term	Coordinate
Tank-ventilation switching valve	F01
Temperature sensor (engine)	C07/D07
Temperature sensor (intake air)	C05/D09
Test prerequisites	B02
Testers	A09
Throttle-body injection unit	A25
Throttle-valve actuator	C17/D21
Throttle-valve adjustment	B25/D01
Throttle-valve potentiometer	C13/D05
Tools	A09
Transmission switch	B27
Trouble-shooting chart	B03
Trouble-shooting program	D23
t v encoding	C01
Universal test adapter	A10
Voltage supply	B07

For production reasons:
continued on the following
coordinate.

TABLE OF CONTENTS

Section	Coordinate
Structure of this microcard.....	A01
How to use this microcard.....	A02
Special features.....	A03
Safety and precautionary measures.....	A07
Testers and tools.....	A09
Installation position of components.....	A13
Removal and installation	
Temperature sensor (intake air).....	A17
Solenoid-operated injection valve.....	A19
Throttle-valve actuator.....	A21
Throttle-body injection unit.....	A25
Diagram of air and fuel lines.....	A27
How to use trouble-shooting chart and trouble-shooting program.....	B01
Trouble-shooting chart.....	B03
Check list for universal test adapter.....	B04
How to use self-diagnosis, self-diagnosis test table and trouble-shooting program.....	C19
Activation of self-diagnosis.....	C21
Self-diagnosis test table.....	C23
Self-diagnosis trouble-shooting program.....	C27
Trouble-shooting program.....	D23
Index.....	N24

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